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COLOUR INDEX

Third Edition

Volume 4

THE SOCIETY OF DYERS AND COLOURISTS

AMERICAN ASSOCIATION OF TEXTILE
CHEMISTS AND COLORISTS

COLOUR INDEX

THIRD EDITION

VOLUME

4

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P.O. Box 244 Perkin House 82 Grattan Road Bradford Yorkshire BD1 2JB England

and

The American Association of Textile Chemists and Colorists

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CHEMICAL CONSTITUTIONS

THE COLORANTS LISTED in volume 5 have their C.I. Generic Names included in this volume if their chemical constitutions have been disclosed. A number of colorants which are not now known to be still manufactured are also included. Some of these latter are of real historical interest, most are of interest for their relation to current products. They are distinguished by the absence of a C.I. Generic Name. All colorants, whether or not their constitutions have been disclosed, are listed under their commercial names in Volume 5.

Each entry has been given a separate five-figure number known as a C.I. Constitution Number. In order to avoid confusion with the First Edition numbers only five-figure numbers have been used. Numbers originally allotted were multiples of five to leave space for future similar dyes to be assigned numbers in the correct chemical sequence. Where dyes or pigments differ only in the metal or acid used for salt formation, a subdivision has been made by addition of a sixth figure after a colon.

The colorants are arranged strictly on the basis of their chemical structures; for this reason those which are chemically related but belong to different usage classes may be found together. Grouped in the following classes, they appear in this order.

| | <i>C.I. Numbers</i> | | <i>C.I. Numbers</i> |
|-----------------|---------------------|--------------------|---------------------|
| Nitroso | 10000-10299 | Indamine | 49400-49699 |
| Nitro | 10300-10999 | Indophenol | 49700-49999 |
| Monoazo | 11000-19999 | Azine | 50000-50999 |
| Disazo | 20000-29999 | Oxazine | 51000-51999 |
| Trisazo | 30000-34999 | Thiazine | 52000-52999 |
| Polyazo | 35000-36999 | Sulfur | 53000-54999 |
| Azoic | 37000-39999 | Lactone | 55000-55999 |
| Stilbene | 40000-40799 | Aminoketone | 56000-56999 |
| Carotenoid | 40800-40999 | Hydroxyketone | 57000-57999 |
| Diphenylmethane | 41000-41999 | Anthraquinone | 58000-72999 |
| Triarylmethane | 42000-44999 | Indigoid | 73000-73999 |
| Xanthene | 45000-45999 | Phthalocyanine | 74000-74999 |
| Acridine | 46000-46999 | Natural | 75000-75999 |
| Quinoline | 47000-47999 | Oxidation Bases | 76000-76999 |
| Methine | 48000-48999 | Inorganic Pigments | 77000-77999 |
| Thiazole | 49000-49399 | | |

The description of each class of colorants is preceded by a brief account of the characteristics of its members. Typical structures are usually shown and, where the class comprises a variety of chemical types, the order in which these are dealt with is explained. The description also includes useful general references to colorants of the class which is being reviewed.

Within each class the colorants are arranged according to the following principles – Simpler colorants precede more complex dyes and aliphatic compounds precede aromatic compounds which appear in the order – benzene, naphthalene, anthracene, heterocyclic.

In each chemical class the colorants are arranged accordingly as they contain amino, hydroxy or both amino and hydroxy groups. In the anthraquinone series the hydroxylated compounds form such a small proportion that they have been dealt with first leaving the main arrangement to be based on the position and number of amino groups.

The arrangement within the various sub-classes is, in general, according to the following order of the substituents, halogen, $-\text{NO}_2$, $-\text{NH}\cdot\text{CO}\cdot\text{R}$, $-\text{CO}\cdot\text{NH}\cdot\text{R}$, $-\text{SO}_2\text{NHR}$, $-\text{SO}_2\text{R}$.

In the azo colorants those compounds containing salt-forming groups such as SO_3H are grouped together as, in this way, usage groups which would otherwise be widely scattered as e.g. Disperse Dyes, Solvent Dyes and Pigments, are brought together.

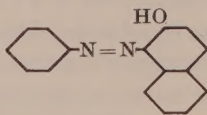
For each colorant there is recorded the five-figure C.I. Constitution Number, the C.I. Generic Name, the structural formula, methods of preparation, chemical and physical properties, references, patent numbers and, where appropriate, classical names.

In the case of those colorants no longer known to be manufactured the *original* names and makers are indicated.

Attention is drawn to the following points.

Structural Formulae

The purpose of the constitution section is to convey maximum information about the colorants listed consistent with clarity and the brevity which is necessary in tables of reference. For this reason no special provision has been made for the recording of the variety of structural forms in which certain colorants have been shown to exist. For example, 1-benzeneazo-2-naphthol (C.I. 12055) is shown simply as—



all other possible forms of the molecule being omitted. Similarly, the triarylmethane dyes are shown in the ammonium form to the exclusion of all other forms. It is hoped that the adoption of this simple plan will aid rapid reference and comparison between colorants whilst presenting no obstacle to the reader who may be interested in the finer points of chemical structure.

The structures which are printed are those supplied by manufacturers or recorded in the literature. In some cases the structures have been established in the most rigorous way; in others strict experimental proof of the constitutions given may be lacking. Where the degree of uncertainty is known, as in the position of the substituents in some sulfonated or directly halogenated dyes, it has been possible to indicate this in the structures given. Examples are C.I. 65005 and 70325.

Methods of Preparation

These are given briefly and with the object of indicating only the general character of the processes involved. The methods recorded are those supplied by colorant manufacturers or described in text books, journals, patent literature, BIOS and FIAT and other reports on the German dye industry.

Properties

The properties recorded are those which will assist in identification or which are of interest in relation to use.

Chemical Names

The Society of Dyers and Colourists and the American Association of Textile Chemists and Colorists employ different systems of nomenclature and it has, therefore, been necessary to choose a system of nomenclature acceptable to both. After careful discussion it has been agreed that the system of nomenclature employed in Chemical Abstracts shall be adopted. At the same time the principle has been kept in mind that the *Colour Index* is intended for easy and convenient reference by many different kinds of scientists and technologists. For this reason the use of complicated systematic names in the Preparation column has been avoided for the commoner intermediates and simpler, readily recognisable trivial names have been used instead. The full Chemical Abstracts names, however, are given in the Intermediates Index, frequently with cross references from the simpler names in common use.

Patents

The Patent numbers quoted relate to the manufacture of the colorants.

The British Patents appear first, followed by the U.S. Patents and those of other countries in alphabetical order except for the German Patents. The German Patents are placed at the end in order to facilitate reference to Friedlander.

Literature

Literature references appropriate to the individual sections appear at the end of the introduction to each chemical class.

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NITROSO COLOURING MATTERS (Quinone Oximes)

Tautomeric *ortho*-nitrosophenols (or naphthols) behave as mordant dyes forming chelate complexes with metals when applied in the form of hydroxides or of salts of very weak acids. The chromophore is —N=O . The dyes are polygenetic, but only the green iron complexes, because of their very good fastness to light, have found application in dyeing and printing. Tautomeric *para*-nitrosophenols (or naphthols) do not possess the property of complex formation with metals and so are not employed as dyes.

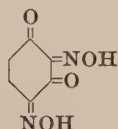
The dyes are commonly prepared by the action of nitrous acid on phenols or naphthols but it is of interest that nitroso- and hydroxyl-groups may be simultaneously introduced in *ortho*-position exclusively, by the combined action of the nitrosyl radical and an oxidising agent in the presence of a copper salt [cf. Baudisch, *Naturwissenschaften*, **27** (1939), 769; *JACS*, **63** (1941), 622].

When wool and silk are treated first with nitrites and then with metallic salts, *ortho*-nitrosation of the tyrosine residues takes place *ortho* to the phenolic group, and chelation with the metal occurs to produce fast hues [cf. Nilssen, *Society of Dyers and Colourists, Symposium on Fibrous Proteins* (1946), 142].

References

Hodgson, *Tautomerism of Benzoquinoneoxime — Nitrosophenol Systems*, *JSDC*, **40** (1924), 167; *JCS* (1937), 520; (1943), 89
Morgan and Main Smith, *JCS*, **119** (1921), 704, 706; *JSDC*, **37** (1921), 215
Lubs, *The Chemistry of Synthetic Dyes and Pigments*, pp. 254–258, New York, 1955

10000 Mordant Dye



React resorcinol with nitrous acid at 5–10°C

Discoverer — Fitz 1875

Fast Green O (H). Formerly used for dyeing iron or chrome mordanted cotton *green* or *yellowish brown* respectively of poor fastness. Iron mordanted wool is dyed *dark green*. In textile printing it is used similarly to **C.I.10005**. Cotton padded with alkali and steamed is dyed a *fast brown*

Fitz, *Ber.* **8** (1875), 631

Manual 628

Grandmougin, *Rev. gén. Mat. col.* **11** (1907), 191

Robinson, *JSDC*, **37** (1921), 229

Morgan & Moss, *JCS*, **121** (1922), 2857

Richard, *Bull. Soc. ind. Mulhouse*, **90** (1924), 275

Voroschev & Bogchanov, *J. Russ. Ph. Chem. Soc.* **61** (1929), 497

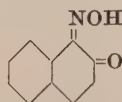
Soluble in hot water and ethanol (yellowish brown)

Explosive when dry

H_2SO_4 conc. — pale yellow; on dilution — brighter

10005 C.I. Mordant Green 4 (Chromium—*Brownish olive* (Iron—*Yellowish green*)

Bisulfite compound of



React 2-naphthol with nitrous acid and convert to the bisulfite compound

H_2SO_4 conc. — dark brown; on dilution — brown flocculent ppt.
Aqueous solution + NaOH — greenish yellow fluorescence

Discoverer — Fuchs 1875

Fuchs, *GP* 25469 (*Fr.* **1**, 335)

ICI, *BP* 381602

du Pont, *USP* 2092750

Fuchs, *Ber.* **8** (1875), 1026

Grandmougin, *Rev. gén. Mat. col.* **11** (1907), 191

Duhem, *ibid.* **24** (1920), 81

Morgan & Main Smith, *JCS*, **119** (1921), 704

Robinson, *JSDC*, **37** (1921), 229

Schmid, *Bull. Soc. ind. Mulhouse*, **89** (1923), 529

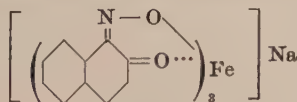
Bradley & Robinson, *JCS* (1934), 1484

Slightly soluble in water (yellow)

Soluble in ethanol (reddish yellow)

Dyes brown on a chrome and scarlet on a cobalt mordant

10006 C.I. Pigment Green 8 (Yellowish green → Olive)



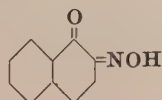
React **C.I.10005** with ferrous sulfate and then with sodium hydroxide

Discoverer — Badische Co. 1921

BIOS 1661, 148; *BIOS* 1548, 213

FIAT 764 — Pigmentgruen B

10010 Mordant Dye



React 1-naphthol with nitrous acid. Some 4-nitroso-1-naphthol is also formed, which has no mordant dyeing properties

Discoverer — Fuchs 1875

Gambine R (H). Formerly used to a limited extent in textile printing. With Iron—*Green*; Chromium—*Cutch brown*. Very fast to light and washing

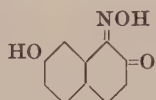
Fuchs, *Ber.* **8** (1875), 1026

Robinson, *JSDC*, **37** (1921), 229

Slightly soluble in water (yellow)

Soluble in ethanol (yellow)

H_2SO_4 conc. — intense brown; on dilution — yellow with brown flocculent ppt.

10015 Mordant Dye

React 2,7-naphthalenediol with nitrous acid at 0°C

H₂SO₄ conc. — green; on dilution — red ppt.
Aqueous solution + NaOH — deep brownish red

Discoverer — Bender 1889

Dioxine L (L). Formerly used to a limited extent in textile printing. With Iron-Green; Chromium-Brown. Very fast to light

Leonhardt Co. *BP* 14230/89, 17223/89; *FP* 201907; *GP* 55204 (*Fr.* 2, 235), 58611 (*Fr.* 3, 806)

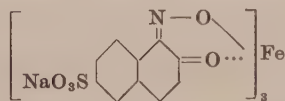
Clausius, *Ber.* 23 (1890), 521; 27 (1894), 3050

Grandmougin, *Rev. gén. Mat. col.* 11 (1907), 190

Robinson, *JSDC*, 37 (1921), 229

Slightly soluble in water

Soluble in ethanol (yellowish red)

10020 C.I. Acid Green 1 (Yellowish green)**10020:1 C.I. Pigment Green 12 (Dull green)**

Nitrosate 2-naphthol-6-sulfonic acid and convert to the iron sodium salt

C.I. 10020:1 is the barium salt of the iron complex

Discoverer — O. Hoffmann 1885

Gans & Co., *BP* 2269/84; *USP* 316036; *GP* 28065, 28901, (*Fr.* 1, 335, 337)

BIOS 961, 31

FIAT 764 — Gruen PLX

Hoffmann, *Ber.* 18 (1885), 46; 24 (1891), 3741

Morgan, *JSDC*, 37 (1921), 47

Barker & Hirst, *JSDC*, 43 (1927), 254

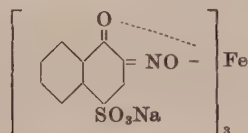
Ind. Eng. Chem. 42 (1950), 7A

Pfitzner, *Z. angew. Chem.* 62 (1950), 242

Soluble in water (yellowish green) with decomposition on long standing

H₂SO₄ conc. — yellowish brown; on dilution — yellow, giving Prussian Blue ppt. with K₄Fe(CN)₆

Aqueous solution + NaOH — bluish green

10025 C.I. Acid Green 4 (Yellowish green)

Nitrosate 1-naphthol-4-sulfonic acid and convert to the iron sodium salt

Aqueous solution + NaOH — unaltered

Discoverer — O. Hoffmann 1885

Naphthol Green G (Lev)

Gans & Co., *BP* 2269/84; *USP* 316036; *GP* 28065, 28901, (*Fr.* 1, 335, 337)

Hoffmann, *Ber.* 18 (1885), 46; 24 (1891), 3741

Morgan, *JCS*, 117 (1920), 1647; *JSDC*, 37 (1921), 47

Morgan & Main Smith, *JCS*, 119 (1921), 706; *JSDC*, 37 (1921), 215

Soluble in water (less so than C.I.10020) and to a yellower green solution

H₂SO₄ conc. — yellowish brown; on dilution — yellow, giving Prussian Blue ppt. with K₄Fe(CN)₆

NOTES

NITRO COLOURING MATTERS

Nitro dyes comprise *o*- and *p*-nitrophenols and *o*- and *p*-nitroamines in which the chromophore is the --NO_2 group and the auxochromes are hydroxyl and amino groups respectively. The dyes exhibit benzenoid-quinonoid tautomerism, and their colour is due to the presence of the quinonoid form. Since the *o*-quinonoid form may be stabilised by hydrogen bonding, it will tend to predominate in the *ortho*-compounds, which, in consequence, generally possess deeper colour than their *para*-isomers. The addition of an alkali to a nitrophenol favours the quinonoid form with resulting deepening of colour. There are two isomeric series of nitrophenol ethers, one coloured and the other colourless (Hantzsch):

The nitro dyes are prepared by the action of nitric acid on phenols and naphthols, on diphenylamines, and on other compounds, e.g. diazotised amines, which are converted into phenols on heating, also by the action of amines on chloronitro-compounds, and by condensing nitro-amines with formaldehyde.

Only those nitro dyes which do not contain a second chromophore are listed in this section. The nitro derivatives of azo, thiazine, hydroxyketone, and anthraquinone dyes appear with the parent dyes.

Sulfonated nitro dyes are used for dyeing wool and silk, whilst unsulfonated nitro-diarylamines are yellow and orange disperse dyes for acetate, polyamide, polyester, and similar fibres. Unsulfonated nitro dyes are also employed as pigments, fungicides, insecticides, and explosives.

References

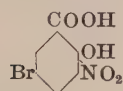
Hantzsch, *Ber.* **39** (1906), 1084

Hantzsch and Gorke, *ibid.* **39** (1906), 1073

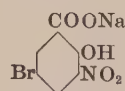
Lubs, *The Chemistry of Synthetic Dyes and Pigments*, pp. 254–258, Reinhold Publishing Corporation, New York, 1955

10300

Acid Dye



Salicyl Yellow A



Salicyl Yellow B

React 5-bromosalicylic acid with nitric acid until mononitrated, and isolate the free acid (Salicyl Yellow A). Convert to the monosodium salt (Salicyl Yellow B)

Discoverer — Schering Co. 1870

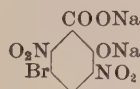
Salicyl Yellow A & B (Schering)

Schering Co., *BP* 1767/81; *GP* 15117, 15889, (*Fr.* **1**, 324, 326)

Soluble in water — A slightly, B more readily (yellow)

10301

Acid Dye



React nitric acid with 5-bromo-3-sulfosalicylic acid and convert to the disodium salt

Discoverer — Schering Co. 1880

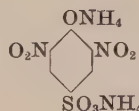
Salicyl Orange (Schering)

Schering Co., *BP* 1767/81; *GP* 15117, 15889, (*Fr.* **1**, 324, 326)

Soluble in water (orange yellow)
Very soluble in ethanol

10302

Acid Dye



React nitric acid with 2-nitro-1-phenol-4-sulfonic acid and convert to the diammonium salt

Discoverer — Beyer and Kegel Co.

Flavaurin or New Yellow (BK)

Beyer & Kegel Co., *BP* 3088/83; *USP* 300874; *GP* 27271 (*Fr.* **1**, 324)

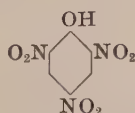
Post, *Ber.* **7** (1874), 1323

Soluble in water (yellow)
 H_2SO_4 conc. — wine red; on dilution — decolorised

10305

Acid Dye (Greenish yellow)

Classical name **Picric Acid**



- (a) Trinitrate phenol or phenol sulfonic acids or sulfanilic acid
- (b) Nitrate benzene in presence of mercury

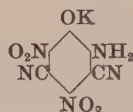
Sparingly soluble in water (yellow)
Readily soluble in ethanol
 H_2SO_4 conc. — yellow; on dilution — unaltered
Aqueous KCN boiling — brown solution of potassium isopurpurate

Discoverer — Woulfe 1771

Picric Acid

Dyes wool, silk, and leather from an acid dyebath in greenish yellow shades of poor fastness to light and washing
Köhler, *GP* 51321, 51603, (*Fr.* **2**, 218, 219), 67074 (*Fr.* **3**, 804)
Wenghöffer, *BP* 16371/00; *USP* 666627; *FP* 303683; *GP* 125096 (*Fr.* **6**, 115)
Gutensohn, *BP* 16628/00; *FP* 304224; *GP* 126197 (*Fr.* **6**, 1161)
Wolffenstein & Böters, *BP* 17541/06; *USP* 923761; *FP* 380121; *GP* 194883, 214045, (*Fr.* **9**, 140, 142)
Green, *BP* 16607/15
Brookes, *BP* 128303
Macdonald, *BP* 126062, 126082, 126675, 126676
Brewster, *BP* 131403
Woulfe, *Phil. Trans.* **61** (1771), 114
Hausmann, *J. Phys. et Chim.* **1.32** (1788), 165
Welter, *Ann. Chim. Phys.* **29** (1799), 301
Dumas, *Ann.*, **9** (1834), 80; 39 (1841), 350
Laurent, *Ann. Chim. Phys.* (3) **3** (1841), 221

10306 Acid Dye



React picric acid with potassium cyanide

Discoverer — Hlasiwetz 1859

Garnet Brown or Garnet Soluble

Hlasiwetz, *Ann.* **110** (1859), 289

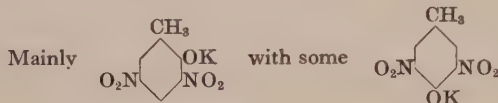
Baeyer, *Jahresber.* (1859), 458

Nietzki & Petri, *Ber.* **33** (1900), 1788

Fierz & Brüttsch, *Helv. Chim. Acta*, **4** (1921), 375

Soluble in hot water (reddish brown)

10310 Acid Dye



(a) React a mixture of sulfo-*o*(and *p*)-cresol with nitric acid

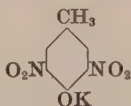
(b) React a mixture of *o*- and *p*-toluenediazonium sulfates with nitric acid

Discoverer — Mittentzwey 1869

Victoria Yellow (LDC). Too fugitive for use in dyeing, but was formerly used for colouring foodstuffs until prohibited on account of its poisonous nature

Martius & Wichelhaus, *Ber.* **2** (1869), 206

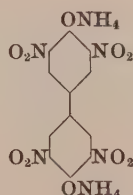
Saffron substitute is mainly



Soluble in water (orange yellow)

H₂SO₄ conc. — pale yellow; on dilution — white ppt.

10311 Acid Dye



Discoverer — Caro 1869

Palatine Orange

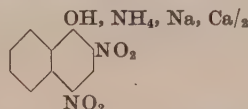
H. Schmidt & G. Schultz, *Ann.* **207** (1881), 325

Tetrazotise benzidine, treat with nitric acid, and convert to the ammonium salt

Slightly soluble in water (orange)

Aqueous solution + HCl — brown ppt.

10315 C.I. Acid Yellow 24 (Yellow)



Discoverers — Ganahl 1856; Martius 1864

Ganahl, *Annalen*, **99** (1856), 240

Martius, *J. prakt. Chem.* **102** (1867), 442

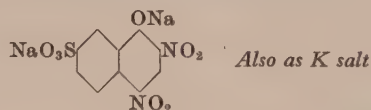
Morgan & Evans, *JCS*, **115** (1919), 1129

Dinitrate 1-naphthol and convert to ammonium, sodium, or calcium salt

Soluble in water; ammonium salt soluble in ethanol

H₂SO₄ conc. — yellow; on dilution — yellow ppt.

10316 C.I. Acid Yellow 1 (Bright greenish yellow)



Also as K salt

Discoverer — Caro 1879

Caro, *GP* 10785 (*Fr.* **1**, 118)

Badische Co., *BP* 5305/79; *USP* 225108; *FP* 134632

Seltzer, *GP* 20716 (*Fr.* **1**, 330)

Levinstein Ltd., *BP* 5692/82; *USP* 289543

Leonhardt Co., *BP* 11318/87

FIAT 764 — Naphtholgelb S

Graebe, *Ber.* **18** (1885), 1126

Knecht & Hibbert, *Ber.* **37** (1904), 2475; *JSDC*, **20** (1904), 249

Morgan & King, *JCS*, **121** (1922), 1728

King, *JCS*, **125** (1924), 1334

React 1-naphthol-2,4,7-trisulfonic acid, or 1-naphthol-4,7-disulfonic acid, or 1-naphthol-2,7-disulfonic acid, or more usually the nitroso-compound of the latter with nitric acid

Naphthol Yellow RS (By) was 2,4-dinitro-1-naphthol-8-sulfonic acid *GP* 40571 (*Fr.* **1**, 393)

Soluble in cold and hot water (yellow) (8% at 0°C)

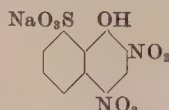
Slightly soluble in ethanol

H₂SO₄ conc. — greenish yellow; on dilution — weaker and brighter

Aqueous solution + KOH — yellow flocculent ppt.

Aqueous solution + FeCl₃ — yellow → yellowish brown

10317 Acid Dye



Discoverer — Mensching 1884

Brilliant Yellow (Sch)

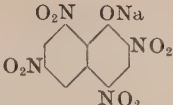
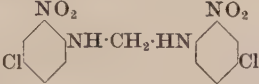
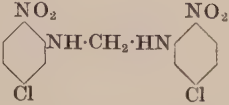
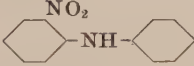
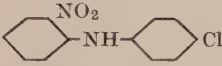
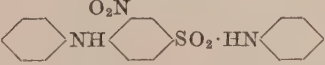
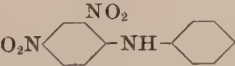
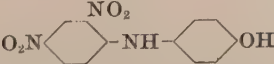
Schoellkopf, Hartford & Hanna Co., *BP* 15775/85, 15782/85; *USP* 333034; *GP* 40571 (*Fr.* **1**, 393)

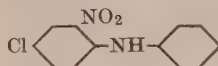
(a) React 1-naphthol-4,8-disulfonic acid with nitric acid

(b) React 1-naphthol-4,8-disulfonic acid first with nitrous acid and then with nitric acid

Soluble in water (brownish yellow)

H₂SO₄ conc. — pale yellow; on dilution — brownish yellow

| | |
|--|--|
| 10318 Acid Dye | <i>Discoverers</i> — Merz and Weith 1882 Sun Gold (MLB) M.L.B., <i>BP</i> 5327/80; <i>USP</i> 244757; <i>FP</i> 140221; <i>GP</i> 14954 (<i>Fr.</i> 1, 331) |
| Probably  | |
| React 1-bromo-tetranitronaphthalene with aqueous sodium hydroxide | Very soluble in hot water (golden yellow) |
| 10320 Acid Dye | <i>Discoverer</i> — Bayer Co. 1881 Croceine Yellow (By) Bayer Co., <i>BP</i> 1225/84, 2030/84; <i>FP</i> 142124; <i>GP</i> 18027 (<i>Fr.</i> 1, 364) Soluble in water (yellow) |
| Nitrated Crocein Acid | |
| React 2-naphthol-8-sulfonic acid with nitric acid | |
| 10325 C.I. Pigment Yellow 11 | <i>Discoverers</i> — Julius and Fussenegger 1909 Badische Co., <i>BP</i> 17546/09; <i>GP</i> 220630 (<i>Fr.</i> 10, 946) Rowe & Levin, <i>JSDC</i> , 38 (1922), 203 <i>BIOS</i> 961, 37 <i>FIAT</i> 764 — Litholechtgelb GG Insoluble in water Slightly soluble in boiling ethanol (yellow) H ₂ SO ₄ conc. — brown; on dilution — yellow brown ppt. |
|  | |
| Condense 4-chloro-2-nitroaniline with formaldehyde | |
| 10330 Pigment | <i>Discoverer</i> — Fussenegger 1908 Pigment Chlorine GG (MLB). Greenish yellow, darkens on exposure to light; good fastness to water, spirit and lime Badische Co., <i>BP</i> 26714/08; <i>USP</i> 932266; <i>FP</i> 396917; <i>GP</i> 206345, 212594, (<i>Fr.</i> 9, 124, 441) Rowe & Levin, <i>JSDC</i> , 38 (1922), 203 Insoluble in water Soluble in hot ethanol (yellow) H ₂ SO ₄ conc. — almost colourless; on dilution — unaltered |
|  | |
| Condense 5-chloro-2-nitroaniline with formaldehyde | |
| 10335 Solvent Dye | <i>Discoverer</i> — Bayer Co. Sudan Yellow 1339 (By) <i>CIOS</i> XXVII-84 p. 61, 62 |
|  | |
| Condense aniline with 1-chloro-2-nitrobenzene | |
| 10336 C.I. Disperse Yellow 22 (Bright yellow) | SRA Fast Golden Yellow XII (BrC) |
|  | |
| Condense <i>p</i> -chloroaniline with 1-chloro-2-nitrobenzene | |
| 10338 C.I. Disperse Yellow 42 (Bright yellow) | <i>Discoverer</i> — P. Fischer, <i>Ber.</i> 24 (1891), 3794 |
|  | |
| Condense aniline (2 mol.) with 4-chloro-3-nitrobenzenesulfonyl chloride | M.p. 157°C |
| 10340 C.I. Disperse Yellow 14 (Bright greenish yellow) | <i>Discoverer</i> — Holland Ellis 1923 Brit. Celanese, <i>BP</i> 222001; <i>USP</i> 1618415 Insoluble in water Slightly soluble in ethanol H ₂ SO ₄ conc. — brown; on dilution — pale yellow Aqueous solution + NaOH — yellow |
|  | |
| Condense aniline with 1-chloro-2,4-dinitrobenzene | |
| 10345 C.I. Disperse Yellow 1 (Bright reddish yellow) | <i>Discoverer</i> — Holland Ellis 1923 Brit. Celanese, <i>BP</i> 222001; <i>USP</i> 1618415 <i>FIAT</i> 764 — Cellitonechtgelb RR Insoluble in water Slightly soluble in ethanol H ₂ SO ₄ conc. — brown yellow; on dilution — yellow |
|  | |
| Condense <i>p</i> -aminophenol with 1-chloro-2,4-dinitrobenzene | |



Condense aniline with 1,4-dichloro-2-nitrobenzene

10350 C.I. Disperse Orange 15 (Bright yellowish orange)



Condense 1,4-dichloro-2-nitrobenzene with *p*-anisidine

Discoverer — Holland Ellis 1923

Brit. Celanese, BP 237943, 239470; USP 1618415
Rowe, *RIC Lectures*, 13

Insoluble in water

Soluble in ethanol (yellow)

H₂SO₄ conc. — colourless; on dilution — unaltered

10355 Acid Dye

Mixture of tetranitrodiphenylamine with a little dinitro-diphenylamine

Prepare by nitrating diphenylamine

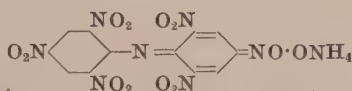
Discoverers — Brooke, Simpson and Spiller 1878

Citronine (BSS)

Soluble in water and ethanol (orange yellow)

H₂SO₄ conc. — brown; on dilution — yellow

10360 Acid Dye



(a) React diphenylamine with nitric acid in conc. sulfuric acid, and convert to the ammonium salt

(b) Condense aniline with 1-chloro-2,4-dinitrobenzene, and nitrate the product first to the tetra- and then to the hexanitro-diphenylamine (GP 86295)

Discoverers — Kopp and Gnehm 1873

Aurantia (GrE). Formerly used in photography for desensitising

Griesheim-Elektron, GP 86295 (*Fr.* 4, 36)

von Schroetter, FP 376340

Kopp & Gnehm, *Ber.* 7 (1874), 309; 9 (1876), 1245

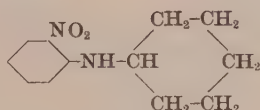
Lumière & Seyewetz, *Brit. J. Photo.* 68 (1921), 351

Soluble in water (orange yellow)

H₂SO₄ conc. — pale yellow; on dilution — yellow ppt.

Aqueous solution + NaOH — deep orange yellow

10365 Solvent Dye



Condense 1-chloro-2-nitrobenzene with cyclohexylamine

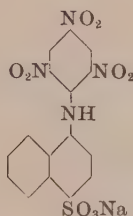
Discoverer — I.G.

Sudan Yellow 5G (IG). Solvent dye; also used in coloured smoke flares

CIOs XXVII-84, 62

FIAT 764 — Sudangelb 5G

10370 Acid Dye



React picryl chloride (1-chloro-2,4,6-trinitrobenzene) with naphthionic acid

Discoverers — Nölting and v. Salis-Mayenfeld 1882

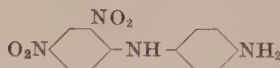
Picryl Yellow

Nölting & v. Salis-Mayenfeld, GP 22268 (*Fr.* 1, 322)

Slightly soluble in water (orange yellow)

10375 C.I. Disperse Yellow 9 (Dull reddish yellow)

C.I. Solvent Orange 53 (Yellowish Orange)



Condense *p*-phenylenediamine with 1-chloro-2,4-dinitrobenzene

Discoverer — Holland Ellis 1923

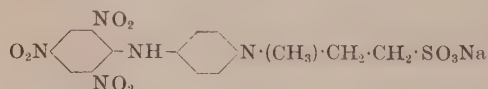
Brit. Celanese, BP 222001; USP 1618415

Insoluble in water

Soluble in ethanol (reddish yellow)

H₂SO₄ conc. — brown; on dilution — yellow brown

10380 C.I. Acid Brown 212



Condense *N*-(*p*-aminophenyl)-*N*-methyltaurine with 1-chloro-2,4,6-trinitrobenzene

Discoverer — I.G.

FIAT 764 — Igenalbraun PM "F"

Soluble in water

10385 C.I. Acid Orange 3 (Dull yellowish orange)

Condense 1-chloro-2,4-dinitrobenzene with 5-amino-2-anilino-benzenesulfonic acid

Discoverer — Schmidlin 1911

M.L.B., *BP* 13672/12; *USP* 1059571; *FP* 443809; *GP* 263655

(*Fr.* 11, 366)

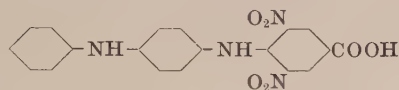
FDX 885 (*PB* 82175)

FIAT 764 — Amidogelb E

Very soluble in cold and hot water (yellow)

Very soluble in ethanol (orange brown)

H₂SO₄ conc. — yellow; on dilution — dull yellow ppt.

10390 Disperse Dye (Dull orange)

Condense 4-chloro-3,5-dinitrobenzoic acid with *N*-phenyl-*p*-phenylenediamine

Discoverer — H. Wagner 1926

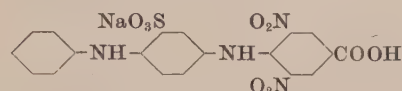
Cellit Brown R (IG)

Cellit Fast Brown R (IG)

Fastness Properties (C): Light 2-3, Hot pressing 3, Steaming 3

Dischargeability, poor

I.G., *BP* 279133; *USP* 1709292; *GP* 504247 (*Fr.* 17, 926), 505885 (dyeing process) (*Fr.* 17, 1513)

10395 C.I. Acid Brown 1 (Reddish brown)

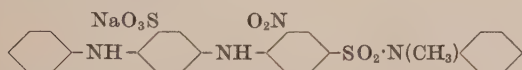
Condense 4-chloro-3,5-dinitrobenzoic acid with 5-amino-2-anilino-benzenesulfonic acid

Discoverer — H. Wagner 1926

I.G., *BP* 279133; *USP* 1709292; *GP* 504247 (*Fr.* 17, 926)

FIAT 764 — Aminonaphtolbraun 3G

H₂SO₄ conc. — greenish yellow; on dilution — orange

10400 Acid Dye

Condense 5-amino-2-anilino-benzenesulfonic acid with 4-chloro-*N*-methyl-3-nitrobenzenesulfonamide

Discoverers — E. Fischer and W. Gmelin 1934

Igenal Brown 3G (IG) — primarily for leather

I.G., *BP* 451183; *USP* 2080704; *GP* 709632

FIAT 764 — Igenalbraun 3G

Soluble in water

10405 Acid Dye

Condense 5-amino-2-(*p*-acetamidoanilino)benzenesulfonic acid with 4-chloro-*N,N*-diethyl-3-nitrobenzenesulfonamide

Discoverers — E. Fischer and W. Gmelin 1934

Anthralan Brown 4G (IG)

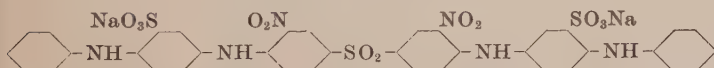
Level dyeing from sulfuric acid dyebath

Fastness Properties (C): Light 6-7, Perspiration 3, Washing 3

I.G., *BP* 451183; *USP* 2080704; *GP* 709632

FIAT 764 — Anthralanbraun 4G

Soluble in water

10410 C.I. Acid Brown 13 (Brown)

Condense bis(4-chloro-3-nitrophenyl) sulfone with 5-amino-2-anilino-benzenesulfonic acid

Discoverer — I.G.

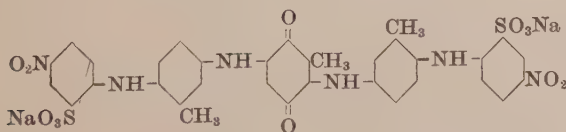
FIAT 764 — Supranolbraun 3GL

Slightly soluble in cold, soluble in hot water (brown)

Soluble in ethanol (brown)

Very soluble in Cellosolve

H₂SO₄ conc. — greenish yellow; on dilution — dull weak orange

10415 C.I. Acid Brown 103 (Dark Brown)

Condense toluene-2,5-diamine (1 mol.) with 2-chloro-5-nitrobenzenesulfonic acid (1 mol.), and react the product (2 mol.) with *p*-toluquinone (1 mol.)

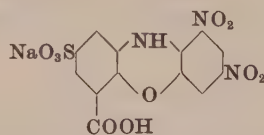
Discoverer — R. Schmidlin 1923

M.L.B., *BP* 219673; *USP* 1711860; *GP* 414390/3 (*Fr.* 15, 429)

BIOS 1548, 70

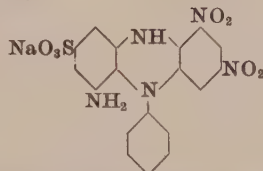
FIAT 764 — Saeurelederbraun EGB

Soluble in water

10425 C.I. Acid Brown 211 (Brown)*Discoverer* — I.G.*FIAT* 764 — Igenalbraun PGG "F" neu

Condense 3-amino-5-sulfosalicylic acid with 1-chloro-2,4,6-trinitrobenzene, and cyclise the product to the oxazine

Soluble in water

10430 Acid Dye*Discoverer* — Agfa**Guinea Brown GRL (A)***FIAT* 764 — Guineabraun RL

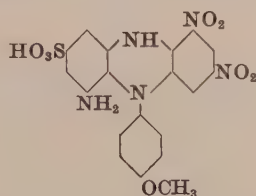
Condense 3,5-diamino-4-anilinobenzenesulfonic acid with 2,4,6-trinitroanisole

Soluble in water

10435 Acid Dye*Discoverer* — Agfa**Guinea Brown RLS (A)**

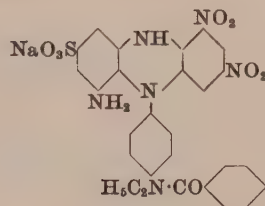
Level dyeing from sulfuric acid bath

Fastness Properties (C): Light 5, Perspiration 3, Washing 3

FIAT 764 — Guineabraun RLS

Condense 3,5-diamino-4-*p*-anisidinobenzenesulfonic acid with 2,4,6-trinitroanisole

Soluble in water

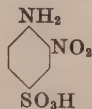
10440 Acid Dye*Discoverer* — I.G.**Supramine Brown GR (IG)***FIAT* 764 — Supraminbraun GR

Condense 3,5 - diamino - 4 - [*p* - (*N* - ethylbenzamido) anilino] - benzenesulfonic acid with 2,4,6-trinitroanisole

Soluble in water

10445 C.I. Solvent Green 13 (Component)*FIAT* 764 — Zaponechtgelb 8431

(Dicyclohexylamine salt)



Aminate 4-chloro-3-nitrobenzenesulfonic acid

NOTES

AZO COLOURING MATTERS

The characteristic feature of the azo colouring matters is the presence of the azo group $-N=N-$ as chromophore, usually associated with auxochromic hydroxyl or amino groups; the dyes exhibit benzenoid-quinonoid tautomerism with the corresponding quinone hydrazones.

Azo dyes are manufactured almost without exception by treating an aqueous solution of a mineral acid salt of a primary arylamine with nitrous acid ("diazotisation") to obtain the diazonium compound which is then combined ("coupled"), usually without isolation, with an aromatic amine or hydroxy compound or a keto compound capable of enolisation. The coupling of amines is usually performed under acid conditions, that of hydroxy compounds under alkaline conditions.

The simple processes of diazotisation and coupling are applicable to a great number and variety of compounds including certain azo compounds which can themselves be diazotised or coupled thus enabling the synthesis of "disazo" and "polyazo" dyes of various patterns. In consequence the azo dyes form by far the largest single class of synthetic dyes (more than two thousand constitutions are recorded in this volume), and have the widest range of applications: there are azo dyes for every fibre, natural and synthetic, for pigments and solvents and for a variety of minor non-textile applications. Azo dyes are therefore divided, according to the number and arrangement of azo groups present, into sub-classes conveniently designated by general formulae using the following symbols (Winther, *Patente der organischen Chemie, 1887-1905, Band 2-Organische Farbstoffe*) —

- A, a "diazo component", i.e. a diazotised arylamine
- D, a "tetrazo component", i.e. a tetrazotised diamine
- E, a coupling component coupled with one molecule of a diazo component
- M, an aromatic amine which after coupling with a diazo component provides an amino group for further diazotisation
- Z, a coupling component coupled with two (or more) molecules of a diazo component or with one molecule of each of two (or more) different diazo components
- $Z \cdot X \cdot Z$, a binuclear coupling component capable of coupling with two molecules of a diazo component or with one molecule of each of two different diazo components
- \rightarrow , diazotised and coupled with

The sub-classes, in the order of their presentation in this volume, are —

| Class of Azo Compound | | General Formula | Pages in this Volume | C.I. Numbers |
|--------------------------------|-----|---|----------------------|--------------|
| Monoazo | | $A \rightarrow E$ | 4013-4138 | 11000-19999 |
| Disazo | I | $A \rightarrow Z \leftarrow A'$ | 4139-4152 | 20000-20999 |
| | II | $D \begin{matrix} \nearrow E \\ \searrow E' \end{matrix}$ | 4153-4224 | 21000-25999 |
| | III | $A \rightarrow M \rightarrow E$ | 4225-4266 | 26000-28999 |
| | IV | $A \rightarrow Z \cdot X \cdot Z \leftarrow A'$ | 4267-4276 | 29000-29999 |
| Trisazo | I | $D \begin{matrix} \nearrow E \\ \searrow Z \leftarrow A \end{matrix}$ | 4277-4290 | 30000-31499 |
| | II | $D \begin{matrix} \nearrow E \\ \searrow M \rightarrow E' \end{matrix}$ | 4291-4311 | 31500-33499 |
| | III | $\begin{matrix} A \\ A' \rightarrow M \end{matrix} \nearrow Z$ | 4312-4313 | 33500-33999 |
| | IV | $A \rightarrow M \rightarrow M' \rightarrow E$ | 4314-4322 | 34000-34899 |
| | V | $A \rightarrow Z \begin{matrix} \nwarrow A' \\ \searrow A'' \end{matrix}$ | 4323-4324 | 34900-34999 |
| Tetrakisazo and higher Polyazo | | Many varieties (see p. 4325 for those of practical significance) | 4325-4344 | 35000-36999 |

The detailed treatment of each sub-class is preceded by a summary statement of its scope in the provision of commercial dyes in relation to the intermediates principally employed. The statement includes a note of the broad principles of chemical progression adopted for the class in question. These principles have as their aim to bring together as far as possible dyes of like general properties. Thus in monoazo dyes it is the coupling component which most often determines the general properties and is therefore chosen as the primary basis for chemical progression.

The details of chemical progression follow the outline given in the general preamble to this volume but they are repeated here with some elaboration specially applicable to azo dyes.

(1) In any one sub-class dyes devoid of $-\text{COOH}$, $-\text{SO}_3\text{H}$ or $-\text{SO}_2\text{NH}_2$ groups precede the much larger number having one or more of these groups. The water-insoluble dyes, which have special applications as disperse dyes, pigments or solvent dyes, are thus separated from the water-soluble dyes. Some disperse dyes, with $-\text{SO}_2\text{NH}_2$ groups, are among the water-soluble dyes, however.

(2) Coupling components are arranged in the order: benzenoid monoamines — benzenoid diamines — naphthylamines — acetoacetylarnides — phenols — naphthols — aminonaphthols — *N*-alkyl(or aryl)aminonaphthols — *N*-acylaminonaphthols — pyrazolones and other heterocyclic compounds.

(3) Diazo components are arranged in order according to their derivation from: anilines — toluidines and homologues — anisidines and homologues — naphthylamines — aminophenols — aminonaphthols.

(4) Within the small groups which thus result, both coupling components and diazo components are arranged according to the substituents present taken in the order: $-\text{COOH}$, $-\text{SO}_3\text{H}$, $-\text{SO}_2\text{NH}_2$, $-\text{SO}_2\text{NHR}$, Halogens, $-\text{NO}_2$, $-\text{NH}\cdot\text{CO}\cdot\text{R}$, $-\text{CNS}$, $-\text{CO}\cdot\text{NH}_2$, $-\text{CO}\cdot\text{NHR}$, $-\text{CHO}$, $-\text{CO}\cdot\text{R}$, $-\text{SO}_2\text{R}$, $-\text{OSO}_2\text{R}$.

Preparative Details

The reactions and processes used in the manufacture of azo dyes are comparatively uniform. Preparative details have therefore been limited to word formulae showing the intermediates used, the conditions of coupling (i.e. whether acid or alkaline) and, for disazo and polyazo dyes, the order in which the several couplings are performed.

Behaviour of particular Coupling Components

References to literature describing the coupling behaviour of particular components are included under the dye in which the compound first appears as an intermediate, e.g. references to the coupling of resorcinol are given under C.I.11920. The number can be readily found from the Intermediates Index. In some cases relevant references have for convenience been repeated under a later dye number, e.g. those for resorcinol are repeated under C.I.20020 where this intermediate first appears coupled with two molecules of diazo component.

A few dyes include a coupling stage in which the use of pyridine (or similar base) is necessary. References to this method of coupling are collected under C.I.34230. Attention is also called to the cases of C.I.26920, 26925, which require the presence of sodium thiosulfate for the second coupling.

Azo Dyes belonging to Two Chemical Classes

There are a few dyes which could on the basis of their chemical constitutions be assigned to either of two classes. These have been dealt with as follows —

Anthraquinone-Azo Dyes — under Anthraquinone Dyes when of the vat class (C.I.65430), otherwise as Azo Dyes (e.g. C.I.11750)

Stilbene-Azo Dyes — under Azo Dyes when made by the process of tetrazotising 4,4'-diamino-2,2'-stilbenedisulfonic acid and coupling. Under Stilbene Dyes when made by condensation of various compounds with 5-nitro-*o*-toluenesulfonic acid or its autocondensation products

Thiazol-Azo Dyes — as Azo Dyes (e.g. C.I.19530–19556)

Insoluble Azo Dyes produced on the fibre

These are treated as a separate class — **Azoic Colouring Matters**, p. 4345

General

- Schweizer, H. R., *Künstliche Organische Farbstoffe und ihre Zwischen-Produkte* (Springer Verlag 1964)
 Fierz-David, H. E., and Blangey, L., *Fundamental Processes of Dye Chemistry* (London & New York, Interscience Publ. 1949)
Thorpe's Dictionary of Applied Chemistry, Vol. IV (London, Longmans, Green & Co., 4th Edition 1940)
 Venkataraman, K., *Chemistry of Synthetic Dyes*, Vol. 1 (New York, Academic Press Inc. 1952)
 Lubs, H. A. (Editor), *Chemistry of Synthetic Dyes and Pigments* (A.C.S. Monograph 127), (New York 1955), pp. 96–180
 Robertson, J. M., *JCS* (1939), 232
 Stead, C. V., *Review of Progress in Coloration* **1** (1970).

Diazo Compounds

- Saunders, K. H., *The Aromatic Diazo-compounds and their Technical Applications* (London, Arnold, 2nd Edition 1949)
 Holzach, K., *Die aromatischen Diazoverbindungen* (Stuttgart, Enke 1947)
 Schmid, H., *Mhft. Chem.*, **83** (1952), 846; **84** (1953), 829; **85** (1954), 424; **86** (1955), 668, 904
 Zollinger, H., *Azo and Diazo Chemistry* (Interscience, 1961)

The Coupling Reaction

- Conant, J. B., and Peterson, W. D., *JACS*, **52** (1930), 1220
 Wistar, R., and Bartlett, P. D., *Ibid.*, **63** (1941), 413
 Hauser, C. R., and Breslow, D. S., *Ibid.*, **63** (1941), 418
 Hodgson, H. H. *et al.*, *JSDC*, **58** (1942), 228; **60** (1944), 16, 120; *JCS* (1945), 207
 Zollinger, H. *et al.*, *Helv. Chim. Acta*, **33** (1950), 530, 538; **34** (1951), 591, 600; **35** (1952), 1215; **36** (1953), 1070, 1723, 1730; **37** (1954), 1954; **38** (1955), 1597
 Pütter, R., *Z. angew. Chem.* **51** (1952), 188
 Zollinger, H., *Chem. Reviews*, **51** (1952), 347

Preparation and Manufacture of Commercial Azo Dyes

Methods for the preparation of selected typical azo dyes are described in the text-books mentioned above. In the reports on German industry the methods of preparation or manufacture for a very large number of commercial azo dyes are described, often with considerable detail. The following reports are of especial value —

- | | |
|----------------------|--|
| <i>BIOS</i> 961 | German Dyestuffs and Dyestuffs Intermediates: Azo and Lake Dyestuffs |
| <i>BIOS</i> 1157 | German Dyestuffs and Intermediates Industry: Dyestuffs and Intermediates at Leverkusen and Uerdingen Factories |
| <i>BIOS</i> 1548 | The Manufacture of Azo and Lake Dyestuffs at Hoechst, Ludwigshafen and Leverkusen |
| <i>BIOS</i> 1661 | German Organic Pigments and Lake Dyestuffs |
| <i>BIOS</i> Misc. 20 | The Development of New Dyes and Colour Application Processes in Germany and Italy during World War II |

The following provide processes in similar detail for many of the intermediates used in the manufacture of azo dyes —

- | | |
|------------------|--|
| <i>BIOS</i> 986 | I.G. Farbenindustrie: Manufacture of Intermediates for Dyestuffs at Griesheim, Hoechst, Ludwigshafen, Mainkur and Offenbach (Parts I and II) |
| <i>BIOS</i> 1152 | I.G. Farbenindustrie: The Manufacture of Miscellaneous Naphthalene Intermediates |
| <i>BIOS</i> 1153 | I.G. Farbenindustrie: The Manufacture of Miscellaneous Dyestuffs Intermediates (excluding Naphthalene Derivatives) |
| <i>FIAT</i> 1016 | Miscellaneous Dyestuff Intermediates at I.G. Farbenindustrie A.G., Leverkusen |

Analysis and Determination of Constitution

- Green, A. G., *The Analysis of Dyestuffs* (London, Griffin 1915)
 Brunner, A., *Analyse der Azofarbstoffe* (Berlin, Springer 1929)

The following are representative of numerous papers describing the determination of constitution of commercial azo dyes and serve to illustrate the methods employed —

- Rowe, F. M. *et al.*, *JSDC*, **37** (1921), 204; **40** (1924), 218; **42** (1926), 80, **44** (1928), 205; **52** (1936), 55
 Palkin, S., and Wales, H., *JACS*, **46** (1924), 1488
 Forster, R. B., and Hanson, T. H., *JSDC*, **42** (1926), 272
 Fierz-David, H. E., and Ziegler, E., *Helv. Chim. Acta*, **11** (1928), 776
 Ruggli, P., and Jensen, P., *Ibid.*, **18** (1935), 624; **19** (1936), 64
 Chen, P., and Cross, E. J., *JSDC*, **59** (1943), 144
 Frahm, E. D. G., *Rec. trav. chim.*, **73** (1954), 748

NOTES

MONOAZO DYES

GENERAL FORMULA: A → E

The monoazo dyes are arranged in two sections consisting of dyes essentially insoluble in water and dyes soluble in water respectively. This is achieved by separating from the remainder those dyes devoid of carboxylic acid, sulfonic acid or salt-forming sulfonamide groups. Within each section the items are arranged in a succession based firstly upon the coupling component (E) and secondly upon the diazo component (A) so that all dyes with a common coupling component are found together. Since the coupling component usually plays the major part in determining the general properties of a monoazo dye this arrangement tends to bring together dyes with common application properties.

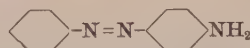
The dyes devoid of carboxylic acid, sulfonic acid or sulfonamide salt forming groups are dealt with first (C.I.11000–C.I.12999). They provide mainly Disperse dyes, Pigments and Solvent dyes. The very much larger section of soluble dyes follows and consists mainly of Acid and Mordant dyes. The hue range of the monoazo Acid dyes is typically from greenish yellow to bluish red and there are very few important examples of deeper (i.e. more bathochromic) hue except among the metal complex dyes which indeed are more closely related in chemical constitution to the Mordant dyes. The calcium or barium salts of some of the Acid dyes have major uses as pigments. The monoazo Mordant dyes provide an almost complete hue range with the limitations that the shades produced are commonly rather dull and that their greatest importance is found in the provision of black and brown shades.

The monoazo dyes fall into the following groups —

| <i>C.I. Numbers</i> | <i>Nature of Coupling Components (E)</i> | <i>Application Classes of Dyes</i> | <i>Number of Dyes</i> |
|---|---|--|-----------------------|
| Dyes without –COOH, –SO₃H or –SO₂NH₂ groups | | | |
| 11000–11435 | Arylamines | Solvent and Disperse (with a few Basic and Mordant) | 67 |
| 11640–11770 | Acetoacetyl compounds | Pigment (Yellow) | 20 |
| 11800–11975 | Phenols | Mordant, Disperse and Solvent | 28 |
| 12000–12020 | 1-Naphthol | Solvent | 4 |
| 12050–12211 | 2-Naphthol | Pigment and Solvent (Red) | 32 |
| 12300–12505 | 3-Hydroxy-2-naphthanilides | Pigment (Red) | 33 |
| 12600–12825 | Heterocyclic hydroxy components, viz. Pyrazolones, Quinolinediols and Hydroxy-heterocyclic-carboxanilides | Disperse, Pigment and Solvent | 25 |
| Water-soluble dyes carrying –COOH, –SO₃H or SO₂NH₂ groups | | | |
| 13000–13001 | Dyes without auxochromic groups | Acid * | 2 |
| 13010–13710 | Arylamines | Acid and Mordant | 84 |
| 13890–13970 | Acetoacetaryl amides | Direct * | 8 |
| 13990–14155 | Salicylic acid | Mordant (Yellow and Orange) | 35 |
| 14160–14345 | Other Phenol derivatives | Mordant (Yellow, Red, Brown), Acid (few) | 27 |
| 14600–15085 | 1-Naphthol and 1-Naphtholsulfonic acids | Acid (Orange, Red and Brown), Mordant (Violet, Blue and Black) | 82 |
| 15500–16315 | 2-Naphthol and 2-Naphtholsulfonic acids | Acid (Orange and Red), Mordant (Violet, Blue and Black) | 116 |
| 16500–16730 | Naphthalenediols and Dihydroxy-naphthalenesulfonic acids | Acid (Bluish red, Violet and Blue), Mordant (Blue and Black) | 34 |
| 17000–17260 | Aminonaphtholsulfonic acids | Acid (Red, Violet, Blue and Brown) | 42 |
| 17500–17670 | N-Alkyl(or aryl)aminonaphthol-sulfonic acids | Mordant (Blue, Green and Black) | 22 |
| 17750–18245 | Acylaminonaphtholsulfonic acids | Direct (Red) — from N-substituted derivatives of J acid | 82 |
| 18670–19245 | Pyrazolones | Acid (Yellow), Mordant (Yellow, Orange and red) | 90 |
| 19300–19610 | Other heterocyclic hydroxy compounds | Acid, Mordant, Direct | 27 |
| TOTAL | | | 836 |

* Notes. 1. In several of these groups of dyes there are exceptional cases of Direct dyes, the properties of which depend essentially on the diazo component, usually dehydrothio-*p*-toluidinesulfonic acid or primuline, e.g. C.I.13920.

2. The characteristic hues quoted above for the Acid dyes do not include those of metal complex dyes. The groups which afford Mordant dyes afford also a number of pre-formed metal complex dyes, usually of chromium, which are Acid dyes with hues similar to those of Mordant dyes.

11000 C.I. Solvent Yellow 1 (Greenish yellow → Reddish yellow)Classical name **Aniline Yellow**

(a) Add an aqueous solution of aniline hydrochloride to one of benzenediazonium chloride then slowly neutralise partially until the benzenediazonium compound has disappeared. Heat the product (diazaminobenzene) in aniline solution containing a small amount of aniline hydrochloride for 2–3 hr. at 30–40°C. Acidify to form the hydrochloride and allow to crystallise out

To obtain *p*-phenylazoaniline base dissolve the hydrochloride in water and basify

(These reactions can be carried out without intermediate isolations by heating a solution of aniline hydrochloride (1 mol.) in aniline (5–6 mol.) with sodium nitrite (slightly less than 1 mol.) then heating for several hr. at 40°C)

(b) Aniline → Anilinomethanesulfonic acid;

then remove the methanesulfonic acid group by hydrolysis with boiling aqueous caustic soda

M.p. (base) 127.5°C (yellowish brown; the hydrochloride forms steel blue crystals)

Soluble in ethanol

Slightly soluble in water (yellow)

H₂SO₄ conc. — brown; on dilution — red solution

HCl — red solution, dissociates on boiling

Discoverer — Ch. Mène 1861

Dale & Caro, *BP* 3307/63

Grässler, *BP* 43/79; *FP* 128113; *GP* 4186 (*Fr.* 1, 439)

Agfa, *BP* 11343/99; *FP* 289482; *GP* 131860 (*Fr.* 6, 872). (Method of coupling through the anilinomethanesulfonic acid)

Griess, *Ann.* 121 (1862), 262

Kekulé, *Z. Chem.* 2 (1866), 689

Martius & Griess, *Z. Chem.* 2 (1866), 132, 689

Schmidt, *Ber.* 5 (1872), 480

Caro & Schraube, *Ber.* 10 (1877), 2230

Landauer, *Ber.* 14 (1881), 393 (Spectrum)

Wallach, *Ber.* 15 (1882), 2829

Witt & Thomas, *JCS*, 43 (1883), 112

Wallach & Kolliker, *Ber.* 17 (1884), 396

Berju, *Ber.* 17 (1884), 1400

Friswell & Green, *JCS*, 47 (1885), 917; 49 (1886), 746; *Ber.* 19 (1886), 2034

Städel & Bauer, *Ber.* 19 (1886), 689, 1953

Goldschmidt & Rosell, *Ber.* 23 (1890), 499

Goldschmidt & Bardach, *Ber.* 25 (1892), 1347

Walther, *J. prakt. Chem.* 52 (1895), 142; 53 (1896), 465

Goldschmidt & Reinders, *Ber.* 29 (1896), 1369, 1905

Paul, *Z. angew. Chem.* 9 (1896), 689

Jansen, *Z. Farb.-Ind.* 12 (1913), 197

Green, *JSDC*, 39 (1923), 12

Vörlander & Wolferts, *Ber.* 56 (1923), 1229

Dubsky & Okáč, *Rec. Trav. chim.* 46 (1927), 296

Rosenhauer & Unger, *Ber.* 61 (1928), 392

Hantzsch & Voight, *Ber.* 62 (1929), 968

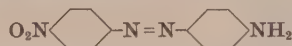
Hantzsch & Burawoy, *Ber.* 63 (1930), 1760

Mechel & Stauffer, *Helv. chim. Acta*, 24 (1941), 151E

Fierz-David & Blangey, 270

11005 C.I. Disperse Orange 3 (Orange)

C.I. Solvent Orange 9



p-Nitroaniline → Anilinomethanesulfonic acid;

then remove the methanesulfonic acid group by hydrolysis with boiling aqueous caustic soda

Discoverers — E. Nölting and F. Binder 1887

Agfa, *BP* 11343/99; *GP* 131860 (*Fr.* 6, 872). (The method of coupling through the methanesulfonic acid)

BIOS 961, 77. BIOS 1548, 199

FIAT 764 — Cellitonechtorange GR

Nölting & Binder, *Ber.* 20 (1887), 3015

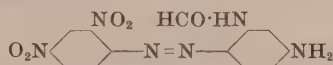
Soluble in ethanol, acetone, Cellosolve and toluene

M.p. 210–212°C

H₂SO₄ conc. — greenish yellow; on dilution — orange

HNO₃ conc. — orange red solution

HCl conc. — brownish yellow solution

11015 Disperse Dye

2,4-Dinitroaniline → *m*-Aminoformanilide

Celliton Red B (IG)

FDX 885 — Cellitonrot B Plv.

11020 C.I. Solvent Yellow 2 (Yellow → Reddish yellow)

Aniline → *N,N*-Dimethylaniline

Discoverers — O. N. Witt 1876; P. Griess 1877

Griess, *Ber.* 10 (1877), 528

Berju, *Ber.* 17 (1884), 1402

Möhlau, *Ber.* 17 (1884), 1490

Landauer, *Ber.* 14 (1881), 393 (Spectrum)

Cornelison, *JACS*, 30 (1908), 1478

Lubs, *Ind. Eng. Chem.* 10 (1918), 438

Mathewson, *Ind. Eng. Chem.* 12 (1920), 883

von Mechel & Stauffer, *Helv. Chim. Acta*, 24 (1941), 24

Anderson, *Nature*, 163 (1949), 444

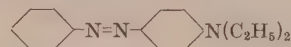
H₂SO₄ conc. — yellow; on dilution — red solution

HCl — red solution from which the hydrochloride crystallises in purple red hair-like needles; the base separates as an orange yellow precipitate on addition of sodium hydroxide

M.p. 115°C (yellow plates)

Soluble in ethanol (yellow)

Insoluble in water

11021 C.I. Solvent Yellow 56 (Reddish yellow)

Aniline → *N,N*-Diethylaniline

Discoverer — R. Meldola 1884

Meldola, *JCS*, 45, 107

Nölting, *Ber.*, 20 (1887), 2994

M.p. 186–187°C (red needles)

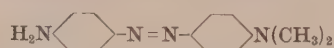
Soluble in ethanol, acetone, Cellosolve, benzene, Stoddard solvent and carbon tetrachloride

H₂SO₄ conc. — brownish yellow; on dilution — orange red

HNO₃ conc. — brownish red solution

HCl conc. — red solution

NaOH conc. — unaltered

11025 C.I. Disperse Black 3 (Black)*

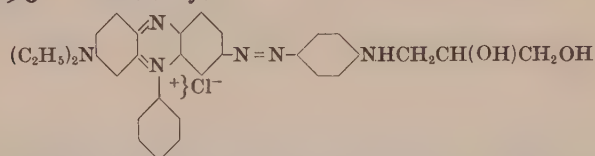
p-Nitroaniline → *N,N*-Dimethylaniline;

then reduce the nitro group

* Developed with 3-hydroxy-2-naphthoic acid

| | |
|--|---|
| 11030 Disperse Dye | Shading colour in Disperse Blacks Stearns, <i>J. Opt. Soc. Amer.</i> 32 (1942), 282 (Phototropic properties) Soluble in acetone |
| $\text{CH}_3\cdot\text{CO}\cdot\text{HN}\langle\text{C}_6\text{H}_4\rangle\text{--N=N--}\langle\text{C}_6\text{H}_4\rangle\text{N(CH}_3)_2$ <p><i>p</i>-Aminoacetanilide → <i>N,N</i>-Dimethylaniline</p> | |
| 11035 C.I. Disperse Black 7 (Bluish black)* | <i>FIAT</i> 764 — Cellitazol AZ, AZN <i>BIOS</i> 961, 80. <i>BIOS</i> 1548, 206 |
| $\text{H}_2\text{N}\langle\text{C}_6\text{H}_3\text{Cl}\rangle\text{--N=N--}\langle\text{C}_6\text{H}_4\rangle\text{N(CH}_3)_2$ <p>2-Chloro-4-nitroaniline → <i>N,N</i>-Dimethylaniline; then reduce the nitro group</p> <p>* Developed with 3-hydroxy-2-naphthoic acid</p> | Soluble in ethanol, acetone, Cellosolve and benzene Slightly soluble in carbon tetrachloride H_2SO_4 conc. — bright reddish violet; on dilution — dull red HCl conc. — yellowish pink solution |
| 11040 C.I. Disperse Red 41 (Red) | Soluble in ethanol, acetone and benzene H_2SO_4 conc. — yellowish brown; on dilution — bluish red NaOH conc. — red |
| $\text{O}_2\text{N}\langle\text{C}_6\text{H}_4\text{OCH}_3\rangle\text{--N=N--}\langle\text{C}_6\text{H}_4\rangle\text{N(CH}_3)_2$ <p>4-Nitro-<i>o</i>-anisidine → <i>N,N</i>-Dimethylaniline</p> | |
| 11045 Basic Dye | <i>Discoverer</i> — E. Kegel 1886 Kegel, <i>GP ap.</i> L3377 Cassella Co., <i>BP</i> 7337/97; <i>FP</i> 265438; <i>GP</i> 95668 (<i>Fr.</i> 4 , 805) <i>C.I.133 (1st Ed.)</i> — This constitution was apparently not correct for Janus Green B. See C.I.11050 <i>Mon. sci.</i> 16 [3] (1886), 984 <i>JSDC</i> , 10 (1894), 150; 14 (1898), 146 Soluble in water and ethanol H_2SO_4 conc. — olive green; on dilution — greenish blue solution, then pure blue solution Aqueous solution + HCl — soluble blue ppt; + NaOH — black ppt. |
| $\text{H}_2\text{N}\langle\text{C}_6\text{H}_4\rangle\text{N}^+\langle\text{C}_6\text{H}_4\rangle\text{N=N--}\langle\text{C}_6\text{H}_4\rangle\text{N(CH}_3)_2$ <p>Phenosafranin (C.I.50200) → <i>N,N</i>-Dimethylaniline</p> | |
| 11050 Basic Dye | Janus Green B (MLB) Used for dyeing wool-cotton unions from an acid bath without mordanting the cotton Patents and Literature as for C.I.11045 <i>FIAT</i> 764 — Janus Green B Reactions very similar to those of C.I.11045 |
| $(\text{C}_2\text{H}_5)_2\text{N}\langle\text{C}_6\text{H}_4\rangle\text{N}^+\langle\text{C}_6\text{H}_4\rangle\text{N=N--}\langle\text{C}_6\text{H}_4\rangle\text{N(CH}_3)_2$ <p><i>N,N</i>-Diethylphenosafranin (C.I.50205) → <i>N,N</i>-Dimethylaniline</p> | |
| 11060 Disperse Dye (Reddish violet) | SRA Red V (Br C) |
| $\text{O}_2\text{N}\langle\text{C}_6\text{H}_3\text{NO}_2\rangle\text{--N=N--}\langle\text{C}_6\text{H}_4\rangle\text{N(C}_2\text{H}_5)_2$ <p>2,4-Dinitroaniline → <i>N,N</i>-Diethylaniline</p> | |
| 11070 Disperse Dye (Bluish pink → Red) | SRA Red III (Br C) |
| $\text{O}_2\text{N}\langle\text{C}_6\text{H}_4\text{OCH}_3\rangle\text{--N=N--}\langle\text{C}_6\text{H}_4\rangle\text{N(C}_2\text{H}_5)_2$ <p>4-Nitro-<i>o</i>-anisidine → <i>N,N</i>-Diethylaniline</p> | |
| 11080 C.I. Disperse Orange 1 (Reddish orange) | <i>Discoverers</i> — Z. Roussin and A. Poirrier 1879 Roussin & Poirrier, <i>Chem. Ind.</i> , 2 (1879), 293 Meldola, <i>JCS</i> , 43 (1883), 440 <i>BIOS</i> 961, 77; <i>BIOS</i> 1548, 199 <i>FIAT</i> 764 — Cellitonechtorange 5R M.p. 151°C (brown plates) Soluble in most organic solvents; H_2SO_4 conc. --- violet |
| $\text{O}_2\text{N}\langle\text{C}_6\text{H}_4\rangle\text{--N=N--}\langle\text{C}_6\text{H}_4\rangle\text{NH}\langle\text{C}_6\text{H}_5\rangle$ <p><i>p</i>-Nitroaniline → Diphenylamine</p> | |
| 11085 C.I. Basic Red 18 (Dull red) | Haigh, <i>Dyer</i> , 132 (1964) 111 |
| $\text{O}_2\text{N}\langle\text{C}_6\text{H}_3\text{Cl}\rangle\text{--N=N--}\langle\text{C}_6\text{H}_4\rangle\text{N}^+\text{C}_2\text{H}_5\text{CH}_2\text{CH}_2\text{N(CH}_3)_3\text{X}^-$ <p>2-Chloro-4-nitroaniline → [2-(<i>N</i>-ethylanilino)ethyl]trimethyl ammonium salt</p> | |

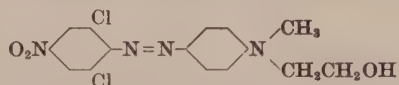
11090

Basic Dye*N,N*-Diethylphenosafranine (C.I. 50205) → 3-Anilino-1,2-propanediol**Copying Black 1059/1527 (IG)**

Solvent dye for copying inks

FIAT 764 — Kopierschwarz 1059/1527

11100

C.I. Disperse Orange 5 (Dull reddish orange)2,6-Dichloro-4-nitroaniline → 2-(*N*-Methylanilino)ethanolI.G., *Sw.P* 151869

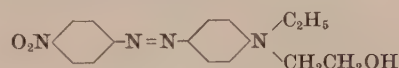
BIOS 961, 76. BIOS 1548, 204

FIAT 764 — Cellitonechtbraun 3R

 H_2SO_4 conc. — reddish brown; on dilution — orange H_2SO_4 10% — no change

NaOH 10% — dark brown

11110

C.I. Disperse Red 1 (Red)*p*-Nitroaniline → 2-(*N*-Ethylanilino)ethanolI.G., *Sw.P* 149405

BIOS 961, 79. BIOS 1548, 200

FIAT 764 — Cellitonscharlach B

Darwalla & Turner, *JSDC*, **69** (1953), 242

M.p. 160°C

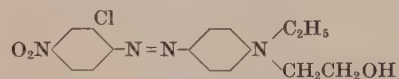
Soluble in ethanol, acetone and benzene

 H_2SO_4 conc. — yellowish brown; on dilution — red to crimson HNO_3 conc. — red solution

HCl conc. — red solution

NaOH conc. — reddish brown solution

11115

C.I. Disperse Red 13 (Bluish red)2-Chloro-4-nitroaniline → 2-(*N*-Ethylanilino)ethanol.

BIOS 961, 78. BIOS 1548, 202

FIAT 764 — Cellitonechtrubin B

Very soluble in ethanol and acetone (deep red)

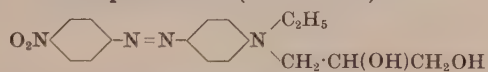
Soluble in benzene and Stoddard solvent

 H_2SO_4 conc. — orange to brown; on dilution — bluish red HNO_3 conc. — orange solution

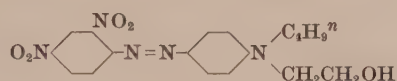
HCl conc. — bluish red solution

NaOH conc. — unaltered

11118

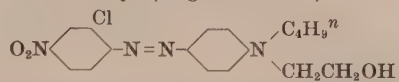
C.I. Disperse Red 2 (Yellowish red)*p*-Nitroaniline → 3-*N*-Ethylanilino-1,2-propanediol*Teintex*, **13** (1948), 442

11120

C.I. Disperse Violet 12 (Reddish violet)2,4-Dinitroaniline → 2-(*N*-Butylanilino)ethanol

BIOS 1548, 203 — Celliton Red Violet RR (Celliton Discharge Violet RR)

11125

Solvent Dye (Bright bluish red)2-Chloro-4-nitroaniline → 2-(*N*-Butylanilino)ethanol**Sudan Red BV (IG)**

BIOS 961, 64

FIAT 764 — Sudanrot BV

Soluble in ethanol, acetone, benzene

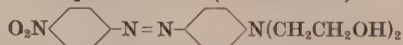
Insoluble in water

11129

C.I. Solvent Yellow 58 (Reddish yellow)

Aniline → 2,2'-(phenylimino)diethanol

11130

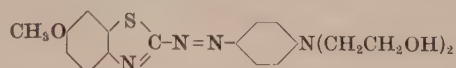
C.I. Disperse Red 19 (Yellowish red)*p*-Nitroaniline → 2,2'-(Phenylimino)diethanol

Discoverers — A. G. Green and K. H. Saunders 1923

Thorpe, **1**, 42Green & Saunders, *JSDC*, **39** (1923), 11

Soluble in ethanol, acetone and benzene

11135

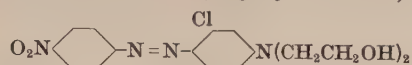
C.I. Disperse Red 58 (Bright bluish pink → Bright red)

2-Amino-6-methoxybenzothiazole → 2,2'-(Phenylimino)diethanol

BIOS 961, 84

PB 74706, fr. 01205 — Cellitonaetzrosa BRF ex.

Note — The information given under FIAT 764 — Cellitonaetzrosa BRF ex. refers in fact to a different dye, Cellitonaetzerubin BBF

11150 C.I. Disperse Red 7 (Bright yellowish red)

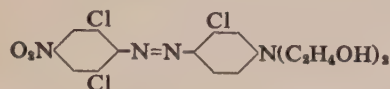
p-Nitroaniline → 2,2'-(*m*-Chlorophenylimino)diethanol

FIAT 764 — Cellitonechtscharlach R

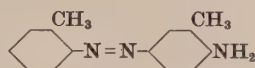
Soluble in ethanol, acetone, Cellosolve and benzene

Slightly soluble in carbon tetrachloride

H₂SO₄ conc. — dull bordeaux; on dilution — bluish pink solution and ppt.

• 11152 C.I. Disperse Brown 1 (Reddish brown)

2,6-Dichloro-4-nitroaniline → 2,2'-(*m*-Chlorophenylimino)-diethanol

11160 C.I. Solvent Yellow 3 (Yellow)

(a) Add sodium nitrite (1 mol.) to *o*-toluidine (8½ mol.) and hydrochloric acid (1 mol. +) keeping temperature down to 28°C until diazotisation is complete. Add a small quantity of hydrochloric acid (about 0.2 mol.) and heat for 3 hr. at 40°C. For isolation basify with caustic soda and separate and distil the oily layer

For a purified product recrystallise from alcohol

(b) *o*-Toluidine → *o*-Toluidinomethanesulfonic acid;

then remove the methanesulfonic acid group by hydrolysis with boiling aqueous caustic soda

See also C.I. 37210, C.I. Azoic Diazo Component 4

Discoverer — R. Nietzki 1877

BIOS 1149, 52

FIAT 764 — Echtgranat GBC Base

Nietzki, *Ber.* 10 (1877), 662

Schultz, *Ber.* 17 (1884), 470

Dubsky & Okáč, *Rec. Trav. chim.* 46 (1927), 296

M.p. 100°C (yellow plates from ethanol)

Soluble in acetone, ethanol, Cellosolve, and toluene

Insoluble in water

H₂SO₄ conc. — brown; on dilution — reddish orange solution and ppt.

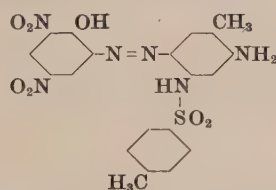
HNO₃ conc. — reddish brown solution

HCl conc. — partial solution (brown)

H₂SO₄ 10% — insoluble

NaOH 10% — slightly soluble (pale yellow)

Alcoholic solution + HCl — red crystals of the hydrochloride, soluble on heating

11170 C.I. Mordant Red 28 (Bordeaux)

Picramic acid → 3'-Amino-*p*-toluenesulfono-*p*-toluidide

Discoverers — W. Herzberg and O. Siebert 1902

Agfa, *BP* 4028/02; *USP* 704825; 704826; *FP* 318806; *GP* 135016 (*Fr.* 6, 919)

Moderately soluble in water (dull yellowish red) and ethanol (reddish brown)

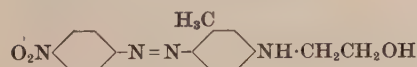
H₂SO₄ conc. — reddish violet; on dilution — brown ppt.

HNO₃ conc. — yellowish brown solution

NaOH dil. (hot) — reddish brown solution

Aqueous solution + HCl — orange yellow ppt;

+ NaOH — violet solution and ppt.

11180 Disperse Dye (Yellowish red)

p-Nitroaniline → 2-(*m*-Toluidino)ethanol

Discoverers — K. H. Meyer and C. Schuster 1924

Celliton Red R (IG)

Fastness Properties (C): Hot pressing 3, Light 4

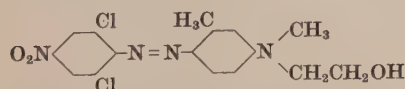
I.G., *BP* 251155; *FP* 600106; *GP* 447420 (*Fr.* 15, 473)

FIAT 764 — Cellitonrot R

H₂SO₄ conc. — brownish red; on dilution — yellowish brown ppt.

HNO₃ conc. — unaltered

HCl conc. — pale red solution

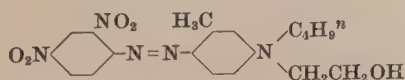
11190 C.I. Disperse Red 32 (Dull red)

2,6-Dichloro-4-nitroaniline → 2-(*N*-Methyl-*m*-toluidino)ethanol

I.G., *Sw.P* 151869-70

BIOS 961, 77

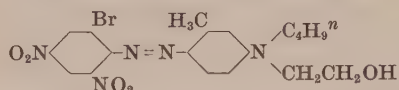
FIAT 764 — Cellitonechtbraun 5R

11195 C.I. Disperse Violet 13 (Bright violet)

2,4-Dinitroaniline → 2-(*N*-Butyl-*m*-toluidino)ethanol

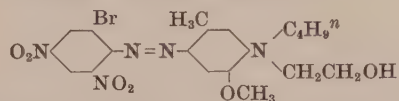
I.G., *Sw.P* 154708

FIAT 764 — Cellitonviolett R Plv.

11200 C.I. Disperse Violet 24 (Bluish violet)

2-Bromo-4,6-dinitroaniline \rightarrow 2-(*N*-Butyl-*m*-toluidino)ethanol

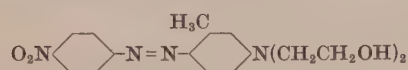
Fastness Properties (C): Hot pressing 4, Light 4, 4-5, 4-5
I.G., BP 409921; USP 1978763; FP 755338; GP 657202 (Fr. 22, 958)
I.C.I., BP 421975; FP 775062; GP 647700 (Fr. 22, 970)

11205 Disperse Dye (Reddish blue)

2-Bromo-4,6-dinitroaniline
 \rightarrow 2-(*N*-Butyl-5-methyl-*o*-anisidino)ethanol

Celliton Discharge Blue 3R (IG)

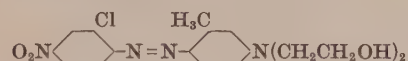
Fastness Properties (C): Hot pressing 3, Light 4, 4, 4-5
I.G., BP 409921; USP 1978763; FP 755338; GP 657202 (Fr. 22, 958)
I.C.I., BP 421975; FP 775062; GP 647700 (Fr. 22, 970)
FIAT 764 — Cellitonaetzblau 3R

11210 C.I. Disperse Red 17 (Red)

p-Nitroaniline \rightarrow 2,2'-(*m*-Tolylimino)diethanol

BIOS 961, 78. BIOS 1548, 201
FIAT 764 — Cellitonechtrot (GG omitted in error)

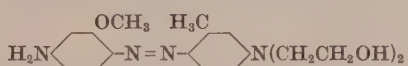
Soluble in ethanol and acetone
H₂SO₄ conc. — orange; on dilution — bright pink
H₂SO₄ 10% — pink
NaOH 10% — no change

11215 C.I. Disperse Red 5 (Bright bluish red)**C.I. Solvent Red 117 (Bluish red)**

2-Chloro-4-nitroaniline \rightarrow 2,2'-(*m*-Tolylimino)diethanol

BIOS 961, 78. BIOS 1548, 202
FIAT 764 — Cellitonechtrubin 3B

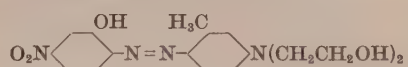
Very soluble in ethanol and Cellosolve (bluish red)
Soluble in acetone
Slightly soluble in benzene and carbontetrachloride
H₂SO₄ conc. — dull bluish red; on dilution — bright red ppt.
H₂SO₄ 10% — red
NaOH 10% — brown

11220 C.I. Disperse Black 4 (Greenish black)*

4-Nitro-*o*-anisidine \rightarrow 2,2'-(*m*-Tolylimino)diethanol;
then reduce the nitro group with sodium sulfide

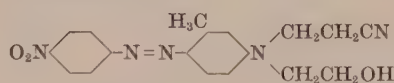
* Developed with 3-hydroxy-2-naphthoic acid

BIOS 961, 75
FIAT 764 — Cellitazol GG
FIAT 1313, III, S 129

11225 C.I. Disperse Red 16 (Bluish red)

2-Amino-5-nitrophenol \rightarrow 2,2'-(*m*-Tolylimino)diethanol

BIOS 1548, 201
FIAT 764 — Cellitonaetzrubin BBF

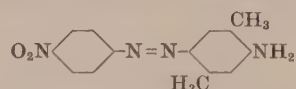
11230 Disperse Dye

p-Nitroaniline \rightarrow β -(*N*-2-Hydroxyethyl-*m*-toluidino)propionitrile

Discoverers — K. Holzach, C. Winter and B. von Bock 1934

Celliton Fast Scarlet RN (IG)

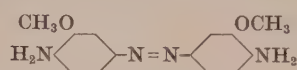
Fastness Properties (C): Hot pressing 3, Light 5, 5-6, 6-7
I.G., BP 432599; USP 2109024; FP 785692; GP 640404 (Fr. 23, 818)
BIOS 961, 78. BIOS 1548, 200
FIAT 764 — Cellitonechtscharlach RN

11240 C.I. Disperse Orange 7 (Bright orange)

p-Nitroaniline \rightarrow 2,5-Xylidine

Beilstein, 16, 358 (discloses compound and preparation method)

Slightly soluble in benzene, ethanol and acetone (orange)
Insoluble in Cellosolve, Stoddard solvent and carbon tetrachloride
H₂SO₄ conc. — orange; on dilution — orange with red fluorescence

11245 Disperse Dye

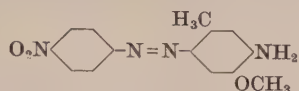
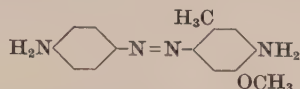
Process of preparation not recorded

Cellitazol BGL (IG)

BIOS 961, 81
FIAT 1313, 3, 129 — Cellitazol BGL

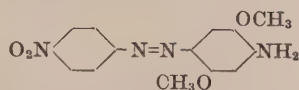
11250 C.I. Disperse Red 31 (Bright yellowish red)

FDX 885 — Cibacetscharlach G

*p*-Nitroaniline → CresidineSoluble in ethanol, acetone and benzene
H₂SO₄ conc. — bluish red; on dilution — scarlet**11255 C.I. Disperse Black 2 (Bluish black)***BIOS 961, 80
FDX 885 — Cellitazol BT

Reduce the nitro group in C.I.11250

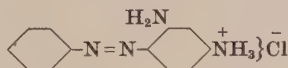
* Developed with 3-hydroxy-2-naphthoic acid

H₂SO₄ conc. — scarlet; on dilution — reddish yellow**11260 C.I. Disperse Blue 11 (Navy)****p*-Nitroaniline → 2,5-Dimethoxyaniline

* Developed with C.I. Developer 9

11270 C.I. Basic Orange 2 (Yellowish orange → Orange)

Discoverers — H. Caro 1875; O. N. Witt 1876

11270:1 C.I. Solvent Orange 3 (Yellowish orange)FIAT 764 — Chrysoidin A, G gr. Krist. 59ST, G konz W,
GG ex. kz. 25656ST, Base AClassical name **Chrysoidine**Aniline → *m*-PhenylenediamineHofmann, *Ber.* **10** (1877), 213Witt, *Ber.* **10** (1877), 350, 654Griess, *Ber.* **10** (1877), 388Landauer, *Ber.* **14** (1881), 393 (Spectrum)Hartley, *JCS*, **51** (1887), 179 (Spectrum)Noelting & Wegelin, *Ber.* **30** (1897), 2595Schmidt & Hagenbocher, *Ber.* **54** (1921), 2201Lumière & Seyewetz, *Brit. Journ. Photog.* **68** (1921), 354Cumming, *JCS*, **123** (1923), 2459Seyewetz & Chaux, *Bull. Soc. chim.* **41** (1927), 332Burr & Burr, *JSDC*, **50** (1934), 42Ruggli & Fischer, *Helv. Chim. Acta*, **28** (1945), 1270Fischer, *J. prakt. Chem.* **107NF** (1924), 39

M.p. (11270B) — 118–118.5°C

Soluble in water (yellowish orange), ethanol, and Cellosolve

Slightly soluble in acetone

Insoluble in benzene

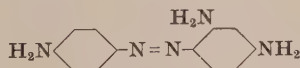
H₂SO₄ conc. — yellow; on dilution — orangeHNO₃ — orange solution

C.I. 11320:1 is the free base

11275 Oxidation Dye**Bistramine Brown G (IG)**

Used for direct and reserve printing

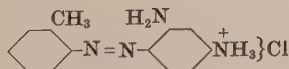
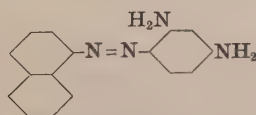
FIAT 764 — Bistramine Brown G

*p*-Aminooxanilic acid → *m*-Phenylenediamine;

then hydrolyse the oxanilide group

11280 Basic Dye**Chrysoidine OPH (IG)**

FIAT 764 — Chrysoidine OPH

*o*-Toluidine → *m*-Phenylenediamine**11285 C.I. Solvent Brown 1 (Reddish orange → Brown)**Agfa, GP 22714 (*Fr.* **1**, 453) (dyes of similar constitution)1-Naphthylamine → *m*-Phenylenediamine

Soluble in ethanol, acetone and benzene

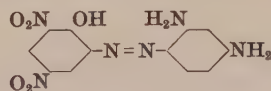
H₂SO₄ conc. — dull reddish yellow to brown; on dilution —
brown solution and ppt.

NaOH conc. — insoluble

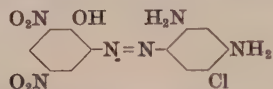
Alcoholic solution + HCl conc. — redder

11290 C.I. Mordant Brown 12 (Dull reddish brown)

Agfa, USP 657064-5; FP 284723; GP 112819 (Fr. 6, 916)

Picramic acid → *m*-Phenylenediamine

Soluble in hot water (orange red) and ethanol (reddish brown)
H₂SO₄ conc. — brown; on dilution — little change
HNO₃ conc. — brown solution; on dilution amber
HCl conc. — amber solution
NaOH conc. — brown solution on warming

11300 C.I. Mordant Brown 48 (Dull reddish brown)Picramic acid → 4-Chloro-*m*-phenylenediamine

Discoverers — W. Herzberg and O. Hansmann 1900

Agfa, BP 10294/00; USP 657064-5; FP 300958; GP 118013 (Fr. 6, 917)

FIAT 764 — Metachrombraun BL

Soluble in hot water (yellowish red)
Moderately soluble in ethanol (reddish brown)
H₂SO₄ conc. — cherry red; on dilution — brown solution, then brown ppt.
HNO₃ conc. — yellowish brown solution
HCl conc. — moderately soluble
NaOH dil. — reddish brown solution

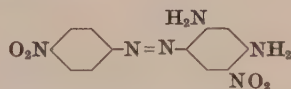
11310★ Disperse Dye

Discoverers — E. Fischer and C. E. Müller 1926

Celliton Printing Yellow 3R (IG)

Fastness Properties (C): Light 2-3, Steaming (volatility) 4
Dischargeability, good

I.G., BP 270352; USP 1684762; FP 633812; GP 461647 (Fr. 16, 1020)

*p*-Nitroaniline → 4-Nitro-*m*-phenylenediamine**11320 C.I. Basic Orange 1 (Dull yellowish orange)**

FIAT 764 — Chrysoidin RL and Base

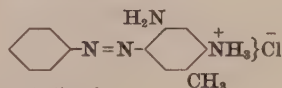
Hoffmann, Ber. 10 (1877), 218

Witt, Ber. 10 (1877), 350

Landauer, Ber. 14 (1881), 394 (Spectrum)

11320:1 C.I. Solvent Orange 4 (Orange)

Classical name — Chrysoidine R



Aniline → Toluene-2,4-diamine

C.I. 11320:1 is the free base

Note — In Chrysoidine RL (IG) part of the toluene-2,4-diamine was replaced by toluene-2,6-diamine

M.p. (C.I.11320B) — 165-166°C

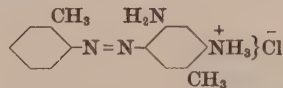
Soluble in water (orange), ethanol, acetone and Cellosolve

H₂SO₄ conc. — yellow; on dilution — orange

HCl conc. — red solution, turns orange

Aqueous solution + HCl — red solution;
+ NaOH — yellow ppt.**11325 Basic Dye**

Discoverer — O. N. Witt 1876

*o*-Toluidine → Toluene-2,4-diamine

Soluble in water and ethanol (red)

H₂SO₄ conc. — brown; on dilution — red slimy ppt.

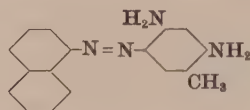
Aqueous solution + HCl — light brown ppt;

+ NaOH — yellow ppt.

11330 C.I. Solvent Brown 2 (Reddish orange → Brown)

Discoverer — C. G. Beretta 1923

Beretta, Gazz. chim. Ital. 53 (1923), 747



1-Naphthylamine → Toluene-2,4-diamine

M.p. 148°C (reddish brown crystals)

Soluble in ethanol, acetone and benzene

H₂SO₄ conc. — yellow; on dilution — bright yellow

NaOH conc. — insoluble

Alcoholic solution + HCl dil. — brownish red;

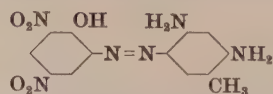
+ NaOH dil. — brownish yellow

11335 C.I. Mordant Brown 4 (Dull reddish brown)

Discoverers — W. Herzberg and O. Hansmann 1898

Agfa, USP 657064-5; FP 284723; GP 112819 (Fr. 6, 916)

Morgan & Main Smith, JCS, 125 (1924), 1733; JSDC, 41 (1925), 233



Picramic acid → Toluene-2,4-diamine

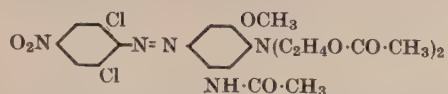
Soluble in hot water (yellowish red) and Cellosolve

Slightly soluble in ethanol and acetone

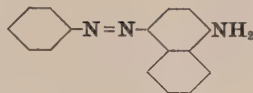
Insoluble in other organic solvents

H₂SO₄ conc. — cherry red; on dilution — little changeHNO₃ conc. — amber solution

NaOH (dil.) — reddish brown solution

11340 C.I. Disperse Violet 58 (Reddish violet)

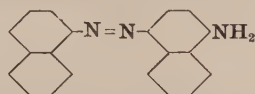
2,6-Dichloro-4-nitroaniline → 3'-Bis(2-acetoxyethyl)amino-*p*-acetaniside

11350 C.I. Solvent Yellow 4 (Bright reddish yellow → Bright yellowish orange)

Aniline → 1-Naphthylamine

Discoverer — P. Griess 1866
Griess, *Ann.* **137** (1866), 60
Michaelis & Erdmann, *Ber.* **28** (1895), 2197

M.p. 123°C (red needles)
Soluble in ethanol and benzene
H₂SO₄ conc. — magenta red; on dilution — reddish brown ppt.
HCl 2% (warm) — magenta red solution and residue
Alcoholic solution + NaOH conc. — yellowish brown solution

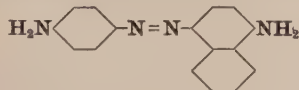
11360 C.I. Solvent Brown 3 (Dull reddish orange → Brown)

1-Naphthylamine → 1-Naphthylamine

Discoverers — A. W. Hofmann, W. H. Perkin and A. H. Church
1856

Perkin & Church, *BP* 859/63
Perkin & Church, *JCS*, **9** (1856), 1; **16** (1863), 207
Rowe, *JSDC*, **54** (1938), 552

Soluble in ethanol, acetone and benzene
H₂SO₄ conc. — reddish brown; on dilution — dark yellow, reddish brown ppt.
NaOH conc. — insoluble

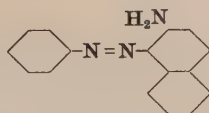
11365 C.I. Disperse Black 1 (Bluish black)*

p-Nitroaniline → 1-Naphthylamine;
then reduce the nitro group

* Developed with 3-hydroxy-2-naphthoic acid

Discoverer — R. Meldola 1883
Meldola, *JCS*, **43** (1883), 432
FIAT 764 — Cellitazol STN
BIOS 961, 75. BIOS 1548, 205

M.p. 159–160°C (yellow brown needles)
Soluble in ethanol, acetone and benzene
H₂SO₄ conc. — reddish violet; on dilution — cherry red
HNO₃ conc. — red solution
HCl conc. — red solution and ppt.
NaOH conc. — unaltered

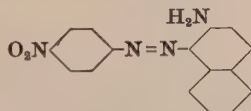
11380 C.I. Solvent Yellow 5 (Reddish yellow → Orange)

Aniline → 2-Naphthylamine

Discoverer — T. A. Lawson 1885
Lawson, *Ber.* **18** (1885), 798
Zincke & Lawson, *Ber.* **20** (1887), 2897
Goldschmidt & Rosell, *Ber.* **23** (1890), 506
Goldschmidt & Poltzer, *Ber.* **24** (1891), 1000
Cornelison, *JACS*, **30** (1908), 1478
Lubs, *Ind. Eng. Chem.* **10** (1918), 438
Mathewson, *Ind. Eng. Chem.* **12** (1920), 883
Pfeiffer, Hesse, Pfitzner, Scholl & Thiebert, *J. prakt. Chem.* **149** (1937), 217
Hodgson & Foster, *JCS* (1941), 755; (1942), 31, 435

M.p. (recrystallised from ethanol) 104°C
H₂SO₄ conc. — bluish violet; on dilution — red solution, then orange ppt.
Alcoholic solution + HCl — redder;
+ NaOH — unaltered

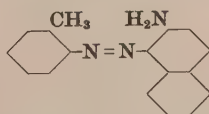
Soluble in ethanol (orange yellow)
Insoluble in water

11385 C.I. Solvent Red 5 (Dull bluish red → Dull reddish violet)

p-Nitroaniline → 2-Naphthylamine

Discoverer — R. Meldola 1883
JCS, **43** (1883), 431
Hodgson & Foster, *JCS* (1941), 755; (1942), 30, 435

M.p. 185.5°C (golden needles from ethanol)
Soluble in ethanol, acetone and toluene
H₂SO₄ conc. — reddish blue; on dilution — magenta to red solution, reddish brown ppt.
NaOH conc. — insoluble

11390 C.I. Solvent Yellow 6 (Reddish yellow → Orange)*

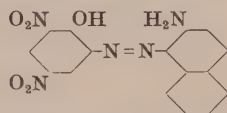
o-Toluidine → 2-Naphthylamine

Discoverer — P. Krüss 1905
Cornelison, *JACS*, **30** (1908), 1478
Krüss, *Z. phys. Chem.* **51** (1905), 270, 277, 287
Lubs, *Ind. Eng. Chem.* **10** (1918), 438
Mathewson, *Ind. Eng. Chem.* **12** (1920), 883
Fischer, *J. prakt. Chem.* **104** (1922), 113
Hodgson & Foster, *JCS*, (1941), 755; (1942), 30, 435

Soluble in ethanol and toluene
Insoluble in water
Deep red crystals from ethanol m.p. 126°C
H₂SO₄ conc. — reddish violet; on dilution — red solution, then orange brown ppt.
Alcoholic solution + HCl — redder;
+ NaOH — unaltered

* In mineral oil

11395 C.I. Mordant Green 24 (Dull green)

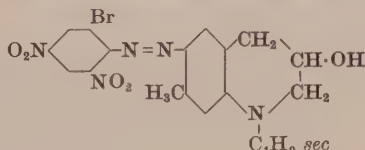


Picramic acid \rightarrow 2-Naphthylamine

Discoverers — C. Mensching and E. F. Ehrhardt 1915
BP 10716/15

Soluble in hot water (violet) and ethanol (reddish violet)
 H_2SO_4 conc. — brownish red; on dilution — violet brown ppt.
 HNO_3 conc. — red solution, rapidly decolourised
Aqueous solution + HCl conc. — dull violet ppt;
+ NaOH conc. — brown ppt.

11410 C.I. Disperse Violet 7 (Bluish violet)



2-Bromo-4,6-dinitroaniline
 \rightarrow 1-*sec*-Butyl-1,2,3,4-tetrahydro-7-methyl-3-quinolinol

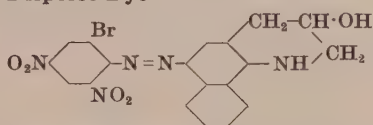
Discoverer — I.G. 1934

BIOS 961, 76, 79

FIAT 764 — Cellitonaetzblau RRF

For preparation of the coupling component *see* —
I.G., BP 456824; USP 2194399
See also patents for C.I.11420

11420 Disperse Dye



2-Bromo-4,6-dinitroaniline
 \rightarrow 1,2,3,4-Tetrahydrobenzo[h]quinolin-3-ol

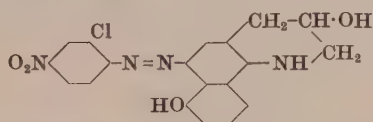
Discoverers — H. Ohlendorf and H. Lange 1933

Celliton Discharge Blue BG (IG)

I.G., BP 474678; USP 2067725; GP 663882 (Fr. 23, 838)

BIOS 961, 83

11430 C.I. Disperse Blue 38 (Dull greenish blue \rightarrow Greenish navy)



2-Chloro-4-nitroaniline
 \rightarrow 1,2,3,4-Tetrahydrobenzo[h]quinoline-3,7-diol

Discoverers — H. Helberger and H. Ohlendorf 1934

I.G., BP 446745; USP 2102593, 2136300; GP 641569 (Fr. 23, 839)

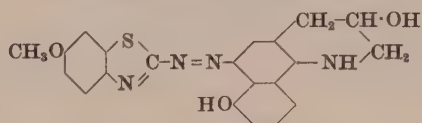
For preparation of the coupling component *see* —

I.G., BP 470640; USP 2062458; GP 634035 (Fr. 23, 267)

BIOS 961, 75

FIAT 764 — Cellitonaetzblau 3G

11435 C.I. Disperse Blue 15 (Greenish blue)



2-Amino-6-methoxybenzothiazole
 \rightarrow 1,2,3,4-Tetrahydrobenzo[h]quinoline-3,7-diol

Discoverers — J. H. Helberger and C. Taube 1934

I.G., BP 440113; USP 2149051; GP 644724 (Fr. 23, 829)

BIOS 961, 75. BIOS.1548, 203

FIAT 764 — Cellitonaetzblau 5G

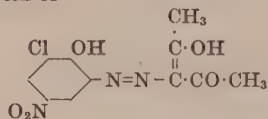
H_2SO_4 conc. — brown; on dilution — bluish grey

H_2SO_4 10% — no change

NaOH 10% — no change

11640 C.I. Acid Orange 100 (Bright yellowish orange)

A 2:1 cobalt complex of



2-Amino-6-chloro-4-nitrophenol \rightarrow Acetylacetone;
then convert to the cobalt complex

Soluble in water (reddish yellow)

Moderately soluble in ethanol (reddish yellow)

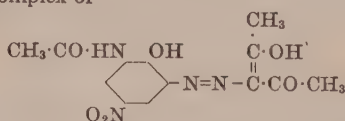
H_2SO_4 conc. — dull yellow; on dilution — dull yellow

Aqueous solution + NaOH — yellow (orange precipitate);

+ HCl — yellow (orange precipitate)

11650 C.I. Acid Yellow 134 (Reddish yellow)

A 2:1 cobalt complex of



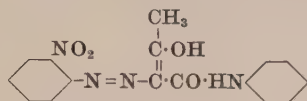
2-Acetamido-6-amino-4-nitrophenol \rightarrow Acetylacetone;
then convert to the cobalt complex

Soluble in water, moderately soluble in ethanol (yellowish orange)

H_2SO_4 conc. — dull reddish yellow; on dilution — yellow (orange precipitate)

Aqueous solution + HCl — reddish yellow (orange precipitate);

+ NaOH — dull yellowish orange (precipitate)

11660 C.I. Pigment Yellow 5 (Bright greenish yellow)

o-Nitroaniline → Acetoacetanilide

Note — In **Hansa Yellow 5G (IG)** 0.2 mol. *o*-nitroaniline was replaced by 2-nitro-*p*-toluidine (compare C.I.11680)

Discoverer — H. Wagner 1909

M.L.B., *BP* 9633/10; *USP* 1082719; *GP* 257488 (*Fr.* **11**, 452)

BIOS 1661, 55

FIAT 764 — Hansagelb 5G Plv.

Burr & Rowe, *JSDC*, **44** (1928), 206

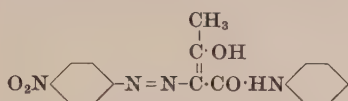
Fierz-David & Ziegler, *Helv. Chim. Acta*, **11** (1928), 779

Soluble in ethanol, acetone and benzene

M.p. 206°C (from glacial acetic acid)

H₂SO₄ conc. — pale yellow; on dilution — primrose yellow ppt.

10% NaOH hot — deeper yellow

11665 C.I. Pigment Yellow 4 (Bright greenish yellow)

p-Nitroaniline → Acetoacetanilide

Discoverer — H. Wagner 1909

M.L.B., *BP* 9633/10; *USP* 1082719; *GP* 257488 (*Fr.* **11**, 452)

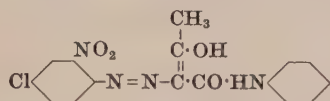
Soluble in ethanol, acetone and benzene

H₂SO₄ conc. — greenish yellow; on dilution — greenish yellow ppt.

HCl conc. — insoluble

KOH (alcoholic) — red solution

NaOH 5% — deepens to orange

11670 C.I. Pigment Yellow 6 (Bright yellow)

4-Chloro-2-nitroaniline → Acetoacetanilide

Discoverer — H. Wagner 1909

M.L.B., *BP* 9633/10; *USP* 1082719; *GP* 257488 (*Fr.* **11**, 452)

Badische Co., *USP* 990173

BIOS 1661, 54, 60

FIAT 764 — Hansagelb 3G Plv., GE Plv.

Burr & Rowe, *JSDC*, **44** (1928), 205

Fierz-David & Ziegler, *Helv. Chim. Acta*, **11** (1928), 776

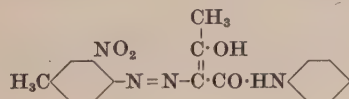
M.p. 250°C (from glacial acetic acid)

H₂SO₄ conc. — deep yellow; on dilution — yellow precipitate

HNO₃ conc. — no change

HCl conc. — no change

NaOH dil. — no change

11680 C.I. Pigment Yellow 1 (Bright yellow)

2-Nitro-*p*-toluidine → Acetoacetanilide

Discoverer — H. Wagner 1909

M.L.B., *BP* 9633/10; *USP* 1082719; *GP* 257488 (*Fr.* **11**, 452)

Bayer Co., *GP ap.* F33190 (*Fr.* **11**, 455), *BP* 9252/14; *GP* 287569, 293429, (*Fr.* **12**, 382, 382)

BIOS 1661, 49 *et seq.*

FIAT 764 — Hansagelb A, G, GA, GGR, GN, GT Plv.

Rowe, Burr & Corbishley, *JSDC*, **42** (1926), 80

Fierz-David & Ziegler, *Helv. Chim. Acta*, **11** (1928), 777

Clark & Newburger, *J. Assoc. Off. Agric. Chem.* **27** (1944), 576

H₂SO₄ conc. — golden yellow; on dilution — yellow ppt.

HNO₃ conc. — no change

HCl conc. — reddish solution

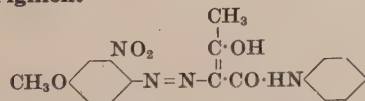
NaOH dil. — no change

Standard

BS 3599/2 C.I. Pigment Yellow 1 (Arylamide Yellow G)

Slightly soluble in ethanol, acetone and benzene

M.p. 256°C (from glacial acetic acid)

11690 Pigment

2-Nitro-*p*-anisidine → Acetoacetanilide

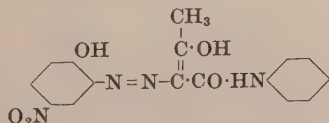
Present only as a minor component in certain mixed pigments of the same class, e.g. Hansa Yellow GE **C.I. Pigment Yellow 6**.

Cf. C.I.11670

BIOS 1661, 60

11700 C.I. Solvent Orange 45 (Orange)

A cobalt complex derived from

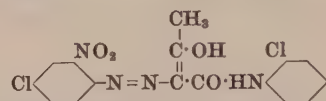


2-Amino-4-nitrophenol → Acetoacetanilide;

then convert to the cobalt complex containing 1 atom of cobalt per 2 mol. monoazo dye

BIOS 960, 96. *BIOS* 961, 94

FIAT 1313, 3, 131

11710 C.I. Pigment Yellow 3 (Bright greenish yellow)4-Chloro-2-nitroaniline → *o*-Chloroacetoacetanilide

H₂SO₄ conc. — yellow; on dilution — primrose yellow
 HNO₃ conc. — no change
 HCl conc. — no change
 NaOH dil. — no change

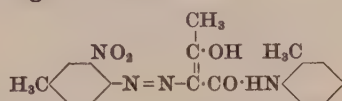
Discoverer — K. Desamari 1911

Bayer Co., BP 23791/11; USP 1059599; FP 448958; GP *ap.*
 F33190 (*Fr.* 11, 455)
 BP 9252/14; GP 287569, 293429, (*Fr.* 12, 382, 382)
 FIAT 764 — Hansagelb 10G Plv.
 BIOS 1661, 56, 57
 Burr and Rowe, *JSDC*, 44 (1928), 205
 Fierz-David & Ziegler, *Helv. Chim. Acta*, 11 (1928), 779

Standard

BS 3599/3 C.I. Pigment Yellow 3 (Arylamide Yellow 10 G)

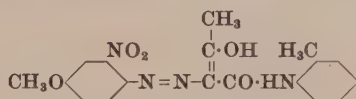
Slightly soluble in ethanol, acetone and benzene
 M.p. 258°C (from glacial acetic acid)

11720 C.I. Pigment Yellow 92 Nitro-*p*-toluidine → *o*-Acetoacetotoluidide

Rowe, Burr & Corbishley, *JSDC*, 42 (1926), 81
 Rowe & Dangerfield, *JSDC*, 52 (1936), 53

Conc. Pigment Fast Yellow GRL New (JWL)

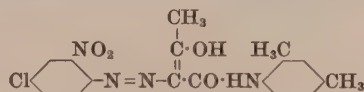
M.p. 235°C (from glacial acetic acid)

11725 C.I. Pigment Orange 1 (Yellowish orange)2-Nitro-*p*-anisidine → *o*-Acetoacetotoluidide

Discoverers — H. Wagner and A. Funke 1926

I.G., BP 272580; USP 1595269, 1644003; GP 461499 (*Fr.* 16,
 1029)
 FIAT 764 — Hansagelb 3R Plv.
 BIOS 961, 33, 113. BIOS 1661, 66

H₂SO₄ conc. — orange; on dilution — orange ppt.
 HNO₃ conc. — deep orange
 HCl conc. — no change
 NaOH dil. — no change

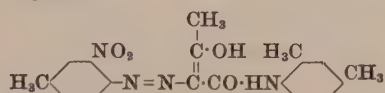
11730 C.I. Pigment Yellow 2 (Bright yellow)

4-Chloro-2-nitroaniline → 2,4-Acetoacetoxyldide

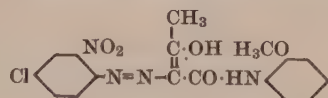
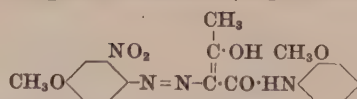
Discoverer — H. Wagner

M.L.B., BP 9633/10; USP 1082719; GP 257488 (*Fr.* 11, 452)
 BIOS 961, 33. BIOS 1661, 63
 FIAT 764 — Hansagelb GR

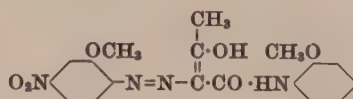
Insoluble in water
 Slightly soluble in ethanol

11735 Pigment2-Nitro-*p*-toluidine → 2,4-Acetoacetoxyldide

Present only as a minor component in certain mixed pigment
 of the same class, e.g. Hansa Yellow A (BIOS 1661, 51, 64)

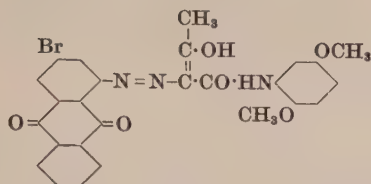
11738 C.I. Pigment Yellow 73 (Bright yellow)4-Chloro-2-nitroaniline → *o*-Acetoacetanisidide**11740 C.I. Pigment Yellow 65 (Bright reddish yellow)**2-Nitro-*p*-anisidine → *o*-Acetoacetanisidide

FIAT 764 — Hansagelb 3RN (error for RN)
 BIOS 1661, 67

11741 C.I. Pigment Yellow 74 (Bright yellow)4-Nitro-*o*-anisidine → *o*-Acetoacetanisidide

11750

Pigment



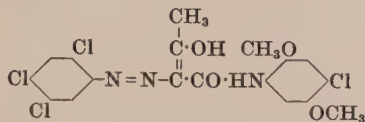
1-Amino-3-bromoanthraquinone → 2',5'-Dimethoxyacetoacetanilide

Spinning Orange GA (IG)

For mass pigmentation of acetate rayon
FIAT 1313, 3, 378

11760

Pigment

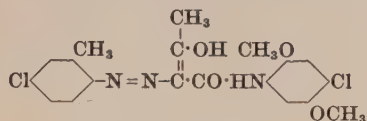


2,4,5-Trichloroaniline → 4'-Chloro-2',5'-dimethoxyacetoacetanilide

FIAT 764 — Spinn gelb f. GV Paste

11765

C.I. Pigment Yellow 49 (Bright yellow)

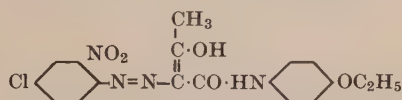
4-Chloro-*o*-toluidine → 4'-Chloro-2',5'-dimethoxyacetoacetanilide

Spinning Yellow GGV (IG)

For mass pigmentation of viscose rayon
FIAT 764 — Spinn gelb GGV f. Plv. (30%)

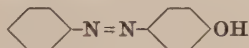
11770

C.I. Pigment Yellow 75 (Reddish yellow)

4-Chloro-2-nitroaniline → *p*-Acetoacetophenetidine

11800

C.I. Solvent Yellow 7 (Bright yellow)



Aniline → Phenol

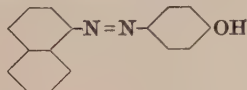
Discoverer — P. Griess 1864

Griess, *Phil. Trans.* **153** (1864), 679
Kekulé & Hidegh, *Ber.* **3** (1870), 233
Wallach and Kiepenheuer, *Ber.* **14** (1881), 2618
Heumann & Oeconomides, *Ber.* **20** (1887), 372
Bamberger, *Ber.* **33** (1900), 3188
Grandmougin & Freimann, *Ber.* **40** (1907), 2662; *J. prakt. Chem.* **78** (1908), 384
Heller & Nötzel, *J. prakt. Chem.* **76** (1907), 58
Heller, *J. prakt. Chem.* **77** (1908), 189
Fierz-David, Blangey & Streiff, *Helv. Chim. Acta*, **29** (1946) 1718

Soluble in ethanol, acetone and benzene
H₂SO₄ conc. — yellowish orange; on dilution — pale yellow
NaOH conc. — golden yellow solution

11810

C.I. Solvent Yellow 8 (Reddish yellow)



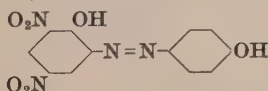
1-Naphthylamine → Phenol

Discoverer — Bayer Co. 1887

Bayer Co., *GP* 43433 (*Winther*, **2**, 1636)
McPherson & Gore, *Am. Chem. J.* **25** (1901), 490
M.p. 136°C (brown needles from alcohol; yellowish needles from benzene)
Soluble in ethanol, acetone and benzene
H₂SO₄ conc. — yellowish brown; on dilution — pale yellow
NaOH conc. — slightly soluble

11820

Acid Dye



Picramic acid → Phenol

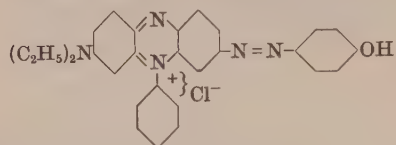
Discoverer — P. Griess 1877

Griess, *BP* 3698/77; *GP* 3224/78 (*Fr.* **1**, 355)
FIAT 764 — Cellitechtorange G

This was formerly used, under the name **Lancaster Yellow**, as a dye for wool applied from an acid bath and could be afterchromed. It was one of the earliest of azo dyes to be manufactured (J. Storey, Lancaster) and appears in the first patent Griess obtained for the manufacture of azo dyes

Much later it was used under the name **Cellit Fast Orange G (IG)** as an acid dye for acetate rayon

H₂SO₄ conc. — reddish yellow
NaOH — yellowish red solution

11825 C.I. Basic Black 2 (Greenish black)

N,N-Diethylphenosafranin → Phenol

FIAT 764 — Diazinschwarz R

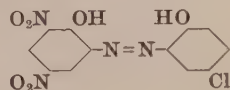
Probably the constitution given under *C.I.134 (1st Ed.)* was incorrect for Diazine Black but some current commercial dyes closely related to C.I. Basic Black 2 may have that constitution

Mon. sci. **16** [3] (1886), 984

JSDC, **10** (1894), 150

Soluble in water (dark greenish blue) and ethanol (reddish blue)
H₂SO₄ conc. — green; on dilution — violet, then blackish green ppt.

Aqueous solution + HCl — Soluble blackish green ppt;
+ NaOH conc. — red ppt.

11830 Mordant Dye

Picramic acid → *p*-Chlorophenol

Discoverers — J. Jansen and W. Neelmeier 1908

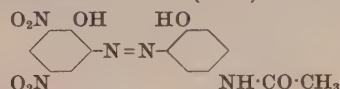
Monochrome Brown G paste (By)

A metachrome dye

Bayer Co., *USP* 936321; *FP* 396833; *GP* 210964 (*Fr.* **9**, 343)

Soluble in water (orange brown) and ethanol (yellowish brown)
H₂SO₄ conc. — brownish orange; on dilution — greenish yellow
Aqueous solution + HCl conc. — greenish yellow;

+ NaOH conc. — golden orange

11835 C.I. Mordant Green 2 (Olive)

Picramic acid → *p*-Hydroxyacetanilide

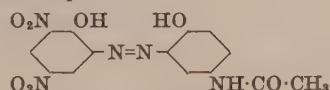
Discoverers — R. Kirchhoff, J. Dedichen and W. Lange 1914

Agfa, *USP* 1219954; *GP* 291499 (*Fr.* **13**, 501)

FIAT 764 — Metachromoliv GG

11836 C.I. Acid Green 62 (Brownish olive)

A 2:1 chromium complex of



Picramic acid → *p*-Hydroxyacetanilide;

then convert to the chromium complex

Soluble in water and ethanol (olive)

H₂SO₄ conc. — brown; on dilution — reddish brown

Aqueous solution + HCl — olive precipitate;

+ NaOH — olive (yellowish olive precipitate)

11837 C.I. Acid Brown 234 (Dull brown)

A nickel complex of the same parent dye as for C.I. 11836

Picramic acid → *p*-Hydroxyacetanilide;

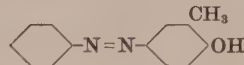
then convert to the nickel complex

Soluble in water and ethanol (reddish brown)

H₂SO₄ conc. — orange brown; on dilution — dull reddish orange

Aqueous solution + HCl — brown precipitate;

+ NaOH — red (brown precipitate)

11840 C.I. Solvent Yellow 10 (Greenish yellow → Reddish yellow)

Aniline → *o*-Cresol

Discoverers — C. Liebermann and St. v. Kostanecki 1884

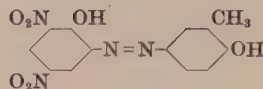
Liebermann & v. Kostanecki; Nölting and Kohn, *Ber.* **17** (1884), 131, 363

Soluble in water (hot) (reddish yellow), ethanol (greenish yellow)
M.p. (from ethanol) 126°–128°C

H₂SO₄ conc. — yellowish brown; on dilution — brick red solution

HCl conc. (warm) — orange brown ppt.

NaOH 2% (warm) — yellowish orange solution

11845 Mordant Dye

Picramic acid → *o*-Cresol

Discoverer — P. Griess 1877

Metachrome Brown Y (Br)

Griess, *BP* 3698/77

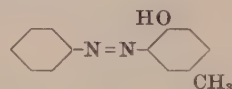
E. F. & H. W. Ehrhardt, *BP* 113181/17; *USP* 1281243

Soluble in water (orange brown)

H₂SO₄ conc. — orange; on dilution — brown ppt.

Aqueous solution + HCl — brown ppt;

+ NaOH conc. — reddish brown

11850 C.I. Solvent Yellow 11 (Greenish yellow)

Aniline → *p*-Cresol

Discoverer — G. Mazzara 1879

Mazzara, *Gazz. Chim. Ital.* **9** (1879), 424

Liebermann & v. Kostanecki, *Ber.* **17** (1884), 131

Soluble in ethanol, acetone and benzene (greenish yellow)

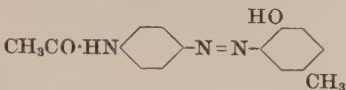
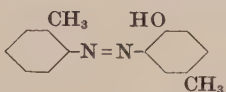
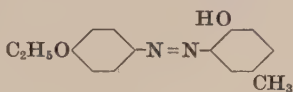
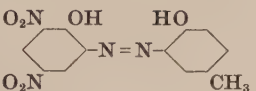
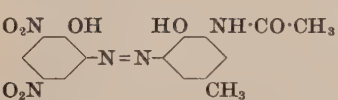
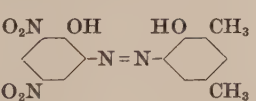
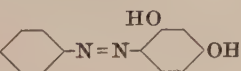
Very slightly soluble in hot water

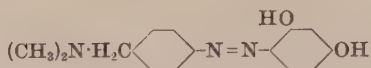
M.p. (from ethanol) 107–108°C

H₂SO₄ conc., reddish brown; on dilution, yellowish brown ppt.

HCl conc. (warm) — orange brown solution

NaOH 2% (warm) — reddish orange solution

| | |
|--|--|
| 11855 C.I. Disperse Yellow 3 (Yellow) C.I. Solvent Yellow 77 (Bright yellow) <div style="text-align: center;">  </div> <p><i>p</i>-Aminoacetanilide → <i>p</i>-Cresol</p> | Discoverers — E. Fischer and C. E. Müller 1926 I.G., <i>BP</i> 270351 (void), 269934; <i>FP</i> 632887; <i>GP</i> 469514 (<i>Fr.</i> 16, 1630) <i>BIOS</i> 961, 77. <i>BIOS</i> 1548, 198 <i>FIAT</i> 764 — Cellitonechtgelb G Plv. Soluble in ethanol, acetone and benzene H ₂ SO ₄ conc. — orange; on dilution — golden yellow to yellowish brown NaOH conc. — orange solution |
| 11860 C.I. Solvent Yellow 12 (Bright greenish yellow → Reddish yellow) <div style="text-align: center;">  </div> <p><i>o</i>-Toluidine → <i>p</i>-Cresol</p> | Discoverers — E. Nölting and P. Werner 1890 Nölting & Werner, <i>Ber.</i> 23 (1890), 3263 Soluble in ethanol, acetone and benzene M.p. (from ethanol) 97°C H ₂ SO ₄ conc. — reddish brown; on dilution — reddish yellow ppt. |
| 11870 C.I. Solvent Yellow 9 (Reddish yellow) <div style="text-align: center;">  </div> <p><i>p</i>-Phenetidine → <i>p</i>-Cresol</p> | Discoverers — C. Liebermann and St. v. Kostanecki 1884 Liebermann & Kostanecki, <i>Ber.</i> 17 (1884), 883 M.p. 103–104°C Soluble in ethanol, acetone and benzene H ₂ SO ₄ conc. — dark brown becoming orange; on dilution — turbid orange NaOH dil. — orange solution |
| 11875 C.I. Mordant Brown 6 (Dull greenish brown → Deep brown) <div style="text-align: center;">  </div> <p>Picramic acid → <i>p</i>-Cresol</p> | Discoverers — E. F. and H. W. Ehrhardt 1917 <i>BP</i> 113181; <i>USP</i> 1281243; <i>GP</i> 344322 (<i>Fr.</i> 13, 499) Soluble in hot water (yellowish brown) Slightly soluble in ethanol and acetone H ₂ SO ₄ conc. — brownish orange to red; on dilution — orange ppt. HNO ₃ conc. — orange solution HCl conc. — very slightly soluble NaOH dil. (warm) — red solution |
| 11880 C.I. Mordant Brown 24 (Brownish olive → Yellowish brown) <div style="text-align: center;">  </div> <p>Picramic acid → 6-Hydroxy-<i>m</i>-acetotoluidide</p> | Discoverer — W. Lange 1920 Agfa, <i>USP</i> 1408363; <i>GP</i> 351001 (<i>Fr.</i> 14, 976) <i>FIAT</i> 764 — Metachrombraun 6G Soluble in water (orange brown) and ethanol (yellowish brown) H ₂ SO ₄ conc. — reddish brown HNO ₃ conc. — pale reddish brown HCl conc. — slightly soluble (yellowish brown) NaOH dil. — brown solution |
| 11890 C.I. Mordant Brown 66 <div style="text-align: center;">  </div> <p>Picramic acid → 2,4-Xylenol</p> | Discoverer — P. C. Holmes 1943 Brotherton Ltd., <i>BP</i> 563772 Soluble in hot water (yellowish brown) and ethanol H ₂ SO ₄ conc. — brown; on dilution — orange ppt. HNO ₃ conc. — amber solution HCl conc. — slightly soluble (pale pink) NaOH dil. (warm) — reddish brown |
| 11920 C.I. Solvent Orange 1 (Yellowish orange) C.I. Food Orange 3 (Yellowish orange) <div style="text-align: center;">  </div> <p>Aniline → Resorcinol</p> <p><i>Note</i> — Preparations commonly contain a proportion of disazo dye</p> <p>In Sudan Orange G (IG) a mixture of aniline and toluidines was used in place of aniline</p> <p>H₂SO₄ conc. — reddish brown; on dilution — yellowish brown solution, then dull orange ppt. NaOH 2% (warm) — orange brown solution Aqueous solution + HCl conc. — slightly deeper, pale brown ppt.</p> | Discoverers — A. Bayer and C. Jaeger 1875 <i>FIAT</i> 764 — Sudanorange G References to the coupling properties of Resorcinol — Baeyer & Jaeger, <i>Ber.</i> 8 (1875), 151 Typke, <i>Ber.</i> 10 (1877), 1577 Wallach, <i>Ber.</i> 15 (1882), 26 Wallach & Fischer, <i>Ber.</i> 15 (1882), 2816 Meyer & Kreis, <i>Ber.</i> 16 (1883), 1329 Liebermann & v. Kostanecki, <i>Ber.</i> 17 (1884), 130, 880 Heumann & Oeconomides, <i>Ber.</i> 20 (1887), 905 Will & Pukall, <i>Ber.</i> 20 (1887), 1121 Pukall, <i>Ber.</i> 20 (1887), 1147 Fischer & Wimmer, <i>Ber.</i> 20 (1887), 1578 Will, <i>Ber.</i> 21 (1888), 604 v. Kostanecki, <i>Ber.</i> 21 (1888), 3119 Bechold, <i>Ber.</i> 22 (1889), 2377 Goldschmidt & Pollak, <i>Ber.</i> 29 (1892), 1343 Orndorf & Ray, <i>Ber.</i> 40 (1907), 3212 Baker, <i>JCS</i> , (1934), 1684 Holzach, <i>Die aromatischen Diazoverbindungen</i> , 140 M.p. 150–170°C (not usually pure as prepared) Soluble in ethanol and ether (yellow) Slightly soluble in water |

11930 Basic Dye

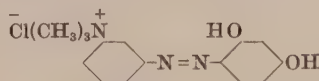
N,N-Dimethyltoluene- α ,4-diamine \rightarrow Resorcinol

Discoverer — A. Weinberg 1892

New Phosphine G (C)

Cassella Co., *BP* 22572/92; *USP* 515100; *FP* 225968; *GP* 70678 (*Fr.* 3, 795)

Soluble in water (yellowish brown)
 H_2SO_4 conc. — yellowish brown; on dilution — unaltered
 Aqueous solution + HCl — unaltered;
 + NaOH — redder and darker

11935 Basic Dye

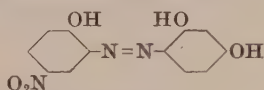
(*m*-Aminophenyl)trimethylammonium chloride \rightarrow Resorcinol

Discoverer — E. König 1895

Azo Phosphine GO (MLB)

M.L.B., *BP* 14494/95; *USP* 626913; *FP* 249227; *GP* 87257 (*Fr.* 4, 809)
 Stadel & Bauer, *Ber.* 19 (1886), 1941

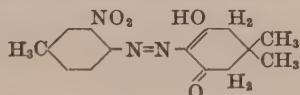
Soluble in water (yellowish red)
 Slightly soluble in ethanol
 H_2SO_4 conc. — brownish red; on dilution — orange yellow
 Aqueous solution + HCl — orange red;
 + NaOH — orange red

11940 C.I. Mordant Red 59 (Dull red)

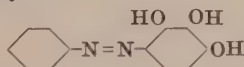
2-Amino-4-nitrophenol \rightarrow Resorcinol

Dorman, *Am. Dyestuff Repr.* 32 (1943), 60

Soluble in water (brick red) and ethanol (orange brown)
 H_2SO_4 conc. — orange brown; on dilution — orange brown ppt.
 HCl conc. — slightly soluble (bright orange)
 NaOH conc. — brick red

11945 Disperse Dye (Bright greenish yellow)

2-Nitro-*p*-toluidine \rightarrow 5,5-Dimethyl-1,3-cyclohexanedione

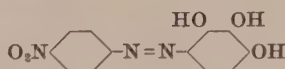
SRA Yellow V (BrC)**11950 Acid Dye**

Aniline \rightarrow Pyrogallol

Discoverer — J. H. Stebbins 1879

Chrome Brown AH

Stebbins, *USP* 221114
 Juillard, *Bull. Soc. Ind. Mulhouse*, 33 (1923), 1084

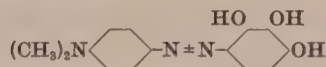
11955 Mordant Dye

p-Nitroaniline \rightarrow Pyrogallol

Brown NP, NJP (DH)

Durand & Huguenin, *BP* 3263/91

Slightly soluble in water
 H_2SO_4 conc. — reddish brown; on dilution — yellowish solution, brown ppt.
 Na_2CO_3 — bluish tint, becoming red brown on dilution

11960 Mordant Dye

N,N-Dimethyl-*p*-phenylenediamine \rightarrow Pyrogallol

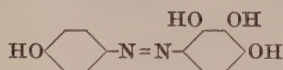
Discoverer — C. Ris 1894

Azogalleine (Gy)

Dyes chromed wool and cotton dark violet; formerly used in calico printing

Geigy, *FP* 230937; *GP* 81376 (*Fr.* 4, 798)

Soluble in ethanol (yellow)
 Slightly soluble in water (greyish yellow)
 H_2SO_4 conc. — dark yellow; on dilution — yellow solution
 Alcoholic solution + HCl — greyish yellow;
 + NaOH — reddish brown

11965 C.I. Mordant Brown 54 (Reddish brown)

p-Aminophenol \rightarrow Pyrogallol

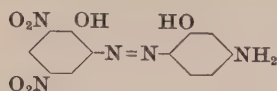
Discoverer — C. Ris 1893

Geigy, *BP* 11902/93; *USP* 548460; *FP* 230937; *GP* 81109 (*Fr.* 4, 797)

FIAT 764 — Chromrotbraun 3RD Teig

Slightly soluble in water (greenish yellow)
 Moderately soluble in ethanol (greenish yellow)
 H_2SO_4 conc. — yellowish brown; on dilution — orange brown
 Aqueous solution + HCl conc. — orange;
 + NaOH conc. — reddish orange brown

11970

Mordant DyePicramic acid → (acetic acid) *m*-Aminophenol**Chrome Brown P (St D)**

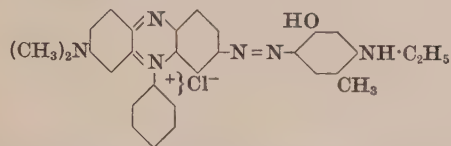
Dyes chromed wool bright brown fast to washing and milling

St. Denis, *FP* 336559; *GP* 169579 (*Fr.* 8, 579)

Soluble in water (reddish brown)

 H_2SO_4 conc. — brownish red; on dilution — brown ppt. HCl — brown ppt. NaOH — unaltered

11975

Basic Dye*N,N*-Dimethylphenosafranine → 3-Ethylamino-*p*-cresol

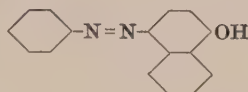
Discoverer — I.G. 1928

Copying Black SK, STK (IG)

Used as a solvent dye for hectograph inks, stamping inks, typewriter ribbons and copying papers and pencils

FIAT 764 — Kopierschwarz SK, STK

12000

C.I. Solvent Brown 4 (Dull reddish brown)

Aniline → 1-Naphthol

Soluble in ethanol, acetone and ethyl acetate

Slightly soluble in benzene

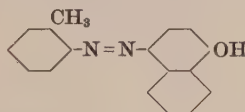
Insoluble in water

Discoverer — P. G. W. Typke 1877

Typke, *Ber.* 10 (1877), 1580Liebermann, *Ber.* 16 (1883), 2858Krohn, *Ber.* 21 (1888), 3240Fischer & Hepp, *Ibid.* 25 (1892), 2732Bamberger, *Ibid.* 28 (1895), 848, 1888Bamberger & Hantzsch, *Ibid.* 28 (1895), 1124Meldola & Morgan, *JCS*, 55 (1899), 608Fierz, *Helv. Chim. Acta*, 4 (1921), 380

The coupling behaviour of 1-naphthol varies with the nature of the diazo component. See C.I.14600–14645

12005

C.I. Solvent Red 2 (Dull red)*o*-Toluidine → 1-Naphthol

Discoverers — Z. Roussin and A. Poirier 1878

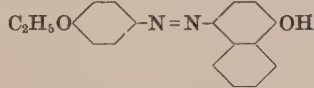
S.A. St. Denis, *USP* 211671Zinke & Rathgen, *Ber.* 19 (1886), 2488*FIAT* 764 — Sudanbraun 3B

M.p. 144–146°C (red needles)

Soluble in benzene

Slightly soluble in ethanol and acetone

12010

C.I. Solvent Red 3 (Bordeaux)*p*-Phenetidine → 1-Naphthol

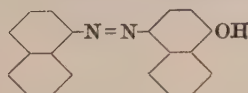
Discoverers — O. N. Witt and A. Buntrock 1894

Witt & Buntrock, *Ber.* 27 (1894), 2360*FIAT* 764 — Sudanbraun B

M.p. 168°C (bronze crystals)

Soluble in ethanol, acetone and benzene

12020

C.I. Solvent Brown 5 (Dull brown)

1-Naphthylamine → 1-Naphthol

Discoverer — H. Caro 1878

Badische Co., *BP* 786/78; *USP* 204799; *FP* 123148; *GP* 5411(*Fr.* 1, 358)*FIAT* 764 — Sudanbraun BB

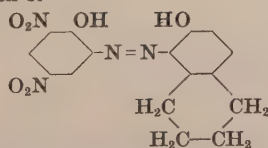
Soluble in ethanol (yellowish brown)

 H_2SO_4 conc. — dull greenish black; on dilution — bluish black, black, then dull brown ppt.Alcoholic solution + HCl conc. — no change;+ NaOH 5% — bluish red

12050

Solvent Dye

A chromium complex of

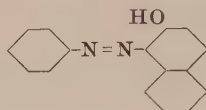


Picramic acid → 5,6,7,8-Tetrahydro-2-naphthol;

then heat with chromium formate in aqueous solution for 2 hr. at 120°C to convert to the chromium complex

Zapon Fast Black NC*FIAT* 764 — Zaponechtschwarz NC*FIAT* 1313, 3, 134

12055 C.I. Solvent Yellow 14 (Reddish yellow)



Aniline → 2-Naphthol

Hauser & Breslow, *JACS*, **63** (1941), 419; *JSDC*, **57** (1941), 201
Cross, *JSDC*, **61** (1945), 75

The following deal with metal complex derivatives —

Elkins & Hunter, *JCS*, (1935), 1598

Drew & Landquist, *Ibid.* (1938), 293

Drew & Fairbairn, *Ibid.* (1939), 824

Drew & Dunton, *Ibid.* (1940), 1065

M.p. 134°C

Soluble in ethanol (orange red), acetone and benzene

Insoluble in water

H₂SO₄ conc. — magenta red; on dilution — orange yellow ppt.

HCl conc. — red solution on warming, hydrochloride crystallises on cooling (dark green) but on separation and exposure loses hydrogen chloride

Discoverer — C. Liebermann 1883

FIAT 764 — Sudanorange R

Liebermann, *Ber.* **16** (1883), 2860

Zincke & Bindewald, *Ber.* **17** (1884), 3031

Margarry, *Gazz.* **14** (1884), 271

Zincke & Rathgen, *Ber.* **19** (1886), 2482

Denaro, *Gazz.* **15** (1885), 405

Zincke & Lawson, *Ber.* **20** (1887), 2903

Fischer & Wimmer, *Ibid.* **20** (1887), 1579

Weinberg, *Ibid.* **20** (1887), 3172

Jacobson, *Ibid.* **21** (1888), 415

Meldola & East, *JCS*, **53** (1888), 460

Meldola & Morgan, *Ibid.* **55** (1889), 603

Goldschmidt & Rossell, *Ber.* **23** (1890), 496

Goldschmidt & Brubacher, *Ibid.* **24** (1891), 2306

McPherson, *Ibid.* **28** (1895), 2418

Hantzsch, *Ibid.* **32** (1899), 3100

Möhlau & Strobach, *Ibid.* **33** (1900), 805

Möhlau & Kegel, *Ibid.* **33** (1900), 2873

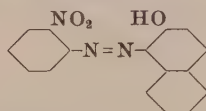
Blangey, *Helv. Chim. Acta*, **8** (1925), 750

Hodgson & Rosenberg, *JCS*, **1930**, 2787

Bradley & Robinson, *Ibid.* **1934**, 1484; cf. *JSDC*, **51** (1935), 37

Rowe & Dangerfield, *JSDC*, **52** (1936), 48

12060 C.I. Pigment Orange 2 (Bright orange)



o-Nitroaniline → 2-Naphthol

Discoverers — E. Bamberger and F. Meimberg 1895

Bamberger & Meimberg, *Ber.* **28** (1895), 1888

Rowe & Levin, *JSDC*, **40** (1924), 227

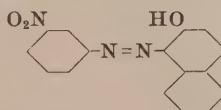
Rowe & Dangerfield, *Ibid.* **52** (1936), 48

Whitmore & Revukas, *JACS*, **62** (1940), 1687

M.p. 244–245°C (dark red, bronzy crystals from hot xylene)

Slightly soluble in ethanol; insoluble in water

12065 Pigment



m-Nitroaniline → 2-Naphthol

Discoverer — R. Meldola 1885

Meta Nitro Orange MN (AAP)

Meldola, *JCS*, **47** (1885), 668; **51** (1887), 440

Meldola & East, *Ibid.* **53** (1888), 465

Meldola & Morgan, *Ibid.* **55** (1889), 116

Rowe & Levin, *JSDC*, **40** (1924), 227

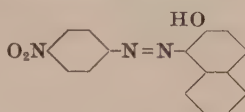
Rowe & Dangerfield, *Ibid.* **52** (1936), 51

Whitmore & Revukas, *JACS*, **62** (1940), 1687

M.p. (recryst. from toluene) 193–194°C

H₂SO₄ conc. — magenta red; on dilution — orange

12070 C.I. Pigment Red 1 (Dull red)



p-Nitroaniline → 2-Naphthol

Discoverer — R. Meldola 1885

FIAT 764 — Pigmentrot B Plv.

Meldola, *JCS*, **47** (1885), 662

Bamberger, *Ber.* **28** (1895), 852

Bamberger & Meimberg, *Ibid.* **28** (1895), 1894

Möhlau, *Ibid.* **31** (1898), 2259

Goldschmidt & Keppeler, *Ibid.* **33** (1900), 902

Rowe & Levin, *JSDC*, **40** (1924), 227

Rowe & Ueno, *Ibid.* **47** (1931), 37

Mason, *Ibid.* **48** (1932), 293

Rowe & Dangerfield, *Ibid.* **52** (1936), 51

Drew & Fairbairn, *JCS* (1939), 824

Whitmore & Revukas, *JACS*, **62** (1940), 1687

Grachev, *J. Gen. Chem.* **18** (1948), 833; compare *Chem. Abs.* **43** (1949), 595

M.p. 256°C (red leaflets from toluene)

Slightly soluble in hot toluene

Very slightly soluble in boiling ethanol

H₂SO₄ conc. — magenta; on dilution — orange ppt.

NaOH 10% (hot) — soluble

Alcoholic KOH — violet

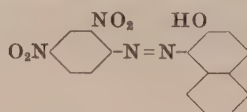
12071 C.I. Pigment Brown 2 (Reddish brown)

A copper complex derived from C.I.12070

Moderately soluble in ethanol and xylene

Very slightly soluble in water

12075 C.I. Pigment Orange 5 (Bright reddish orange)



2,4-Dinitroaniline → 2-Naphthol

Discoverer — R. Lauch 1907

Agfa, *BP* 18736/08; *USP* 912138; *FP* 394754; *GP* 217266 (Fr. 9, 418)

BIOS 1661, 135

FIAT 764 — Permanentrot GG

Rowe & Levin, *JSDC*, **41** (1925), 355

Standard—BS 3599/4 C.I. Pigment Orange 5 (Dinitroaniline Red)

M.p. (from glacial acetic acid) 302°C small red crystals

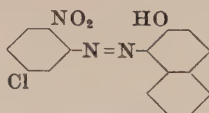
H₂SO₄ conc. — purple; on dilution — orange ppt.

HNO₃ — no change

NaOH — no change

12080

Pigment



5-Chloro-2-nitroaniline → 2-Naphthol

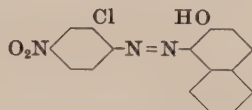
Discoverers — C. Schraube and E. Schleicher 1906

Tuscaline Orange GN (IG)

Badische Co., BP 6228/07; USP 860575; GP 202908 (Fr. 9, 415)
FIAT 764 — Tuscalinorange GN

12085

C.I. Pigment Red 4 (Yellowish red, tint Reddish orange)



2-Chloro-4-nitroaniline → 2-Naphthol

Discoverers — W. Herzberg and O. Spengler 1907

Agfa, USP 865587; FP 368259; GP 180301 (Fr. 8, 704)

BIOS 1661, 137

FIAT 764 — Permanentrot R

Whitmore & Revukas, JACS, 62 (1940), 1687

Standard—BS 3599/5 C.I. Pigment Red 4 (Chlorinated p-nitroaniline Red)

Slightly soluble in ethanol, acetone and benzene

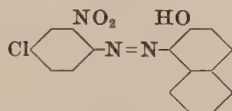
H₂SO₄ conc. — bluish magenta; on dilution — yellowish red ppt.HNO₃ conc. — bright vermilion

NaOH dil. — no change

Alcoholic KOH — violet solution

12090

C.I. Pigment Red 6 (Bright yellowish red)



4-Chloro-2-nitroaniline → 2-Naphthol

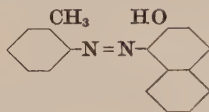
Discoverers — C. Schraube and E. Schleicher 1906

Badische Co., BP 6227/07; USP 860575; GP 200263 (Fr. 9, 415)

Whitmore & Revukas, JACS, 62 (1940), 1687

12100

C.I. Solvent Orange 2 (Reddish orange)



o-Toluidine → 2-Naphthol

Discoverers — Z. Roussin and A. Poirrier 1878

Roussin & Poirrier, USP 211671

Zinke & Rathgen, Ber. 19 (1886), 2491

Rowe & Levin, JSDC, 40 (1924), 226

M.p. (from glacial acetic acid) 131°C (red crystals)

Slightly soluble in ethanol (orange red), acetone and benzene

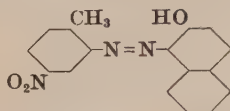
H₂SO₄ conc. — reddish violet; on dilution — scarlet, orange red ppt.HNO₃ conc. — red solution, turns orange

Alcoholic solution + HCl dil. — little change;

+ NaOH dil. — brownish orange

12105

C.I. Pigment Orange 3 (Reddish orange)



5-Nitro-o-toluidine → 2-Naphthol

Discoverer — M.L.B. 1904

Heumann, Anilinfarben, 4 [1] (1903), 1000

Agfa, GP 229266 (Fr. 10, 943)

Leonard & Browne, Sci. Proc. Roy. Dublin Soc. 16 (NS) (1920) 105

Rowe & Levin, JSDC, 37 (1921), 205

M.p. 206°C (long reddish brown needles from acetic acid)

Soluble in hot ethanol (yellowish orange)

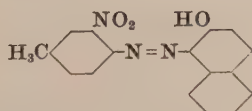
H₂SO₄ conc. — cherry red; on dilution — orange ppt.

Ethanol solution + HCl — redder;

+ NaOH — unaltered

12120

C.I. Pigment Red 3 (Yellowish red)



2-Nitro-p-toluidine → 2-Naphthol

Badische Co., BP 19100/05; FP 357858; GP ap. F20265 (Fr. 8, 725)

BIOS 1661, 49. BIOS 961, 114

FIAT 764 — Hansarot B

Shairraishi, J. Chem. Ind. Tok. 22 (1919), 99

Rowe & Levin, JSDC, 37 (1921), 205

Everest & Wallwork, Ibid. 44 (1928), 102

Whitmore & Revukas, JACS, 62 (1940), 1687

Standards

BS 3599/1 C.I. Pigment Red 3 (Toluidine Red)

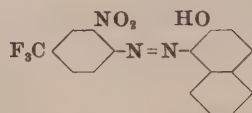
Holland NEN 1964 5271 Pigments. Test methods for Toluidine Red

M.p. 258°C

Slightly soluble in ethanol, acetone and benzene

H₂SO₄ conc. — deep reddish violet; on dilution — orange ppt.HNO₃ conc. — dull vermilion

NaOH dil. — no change

12125 Pigment

2-Nitro-4-trifluoromethylaniline → 2-Naphthol

Lake Fast Orange 4RL (IG)

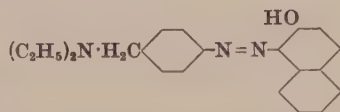
Pigment for wallpaper pulp of excellent light fastness and very good fastness to overprinting

BIOS 1661, 93

FIAT 764 — Litholechtorange 3GL Tg. (20%)

For preparation of intermediate see —

Hoffa & Müller, *USP* 2056899 (Gen — 1936)

12130 Basic Dye

N,N'-Diethyltoluene- α ,4-diamine → 2-Naphthol

H₂SO₄ conc. — cherry red; on dilution — orange brown ppt.

Ethanol solution + HCl — orange brown ppt;

+ NaOH — yellowish brown ppt.

Discoverer — A. Weinberg 1892

Tannin Orange R (C)

Cassella Co. *BP* 22572/92; *USP* 515100; *FP* 225968; *GP* 70678 (*Fr.* 3, 795)

FIAT 764 — Tanninorange R

FIAT 1313, 2, 254

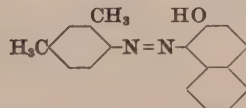
Schoen, *Bull. Soc. Ind. Mulhouse*, **60** (1894), 350

Friedländer & M. Mosczyl, *Ber.* **28** (1895), 1141

JSDC, **11** (1895), 2

Slightly soluble in water (brown)

Soluble in ethanol (brown)

12140 C.I. Solvent Orange 7 (Reddish orange)

2,4-Xylydine → 2-Naphthol

M.L.B., *BP* 5767/83; *USP* 306546; *GP* 29067 (*Fr.* 1, 549)

Bisulfite compound

FIAT 764 — Sudanorange RR

Mühlhäuser, *Dingl.* **264** (1887), 238

Rowe & Levin, *JSDC*, **40** (1924), 227

Cross, *Ibid.* **61** (1945), 75

M.p. (from glacial acetic acid) 166°C

Soluble in ethanol, acetone and benzene (reddish orange)

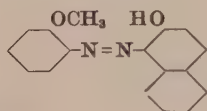
H₂SO₄ conc. — crimson; on dilution — crimson, then orange to reddish brown ppt.

HNO₃ conc. — bright orange solution, becomes duller

NaOH 10% — insoluble (bleeds yellowish)

Alcoholic solution + HCl conc. — orange solution;

+ NaOH conc. — redder

12150 C.I. Solvent Red 1 (Yellowish red → Reddish orange)

o-Anisidine → 2-Naphthol

Discoverer — P. Griess 1899

Badische Co., *USP* 213563; *GP* 12451 (*Fr.* 1, 361)

FIAT 764 — Sudanrot G

Vlies, *JSDC*, **30** (1914), 106

Rowe & Levin, *Ibid.* **40** (1924), 227

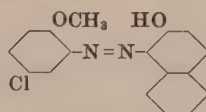
M.p. (from glacial acetic acid) 180°C

Soluble in ethanol (red; on boiling)

H₂SO₄ conc. — claret red; on dilution — dark red ppt.

Alcoholic solution + HCl — wine red;

+ NaOH — orange

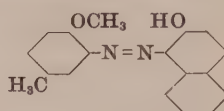
12152 C.I. Pigment Red 93

5-Chloro-*o*-anisidine → 2-Naphthol

Discoverers — P. Julius and M. Jahrmarkt 1901

Badische Co., *USP* 695812; *GP ap.* B29846 (*Fr.* 6, 933)

M.p. 203°C (dark red needles from toluene)

12155 C.I. Solvent Red 17 (Bright red)

Cresidine → 2-Naphthol

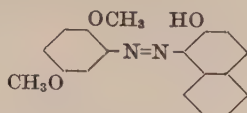
Discoverers — H. W. Elley and H. W. Daudt 1940

Du Pont Co., *USP* 2224904

FIAT 764 — Sudanrot R

Soluble in ethanol, acetone, benzene and gasoline

12156 C.I. Solvent Red 80 Orange → Red)*



2,5-Dimethoxyaniline → 2-Naphthol

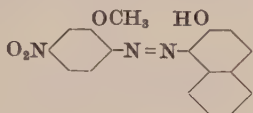
* On skins of mature citrus fruits

Discoverers — H. W. Elley and H. W. Daudt 1940
Du Pont Co., USP 2224904

M.p. 155°–157°C

Slightly soluble in water; partially soluble in ethanol and vegetable oils

12159 C.I. Solvent Red 13 (Yellowish red)



4-Nitro-*o*-anisidine → 2-Naphthol

Discoverers — R. Meldola and J. V. Eyre 1901

Meldola & Eyre, *Chem. News*, **83** (1901), 286

M.p. 269°C (red needles from glacial acetic acid)

H₂SO₄ conc. — violet; on dilution — red ppt.

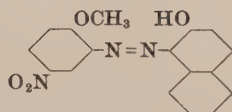
H₂SO₄ 10% — insoluble

HCl conc. — insoluble

HNO₃ conc. — dull red solution

NaOH 10% — insoluble

12160 Pigment



5-Nitro-*o*-anisidine → 2-Naphthol

Discoverer — Badische Co. 1906

Tuscalin Orange G (B) of excellent fastness to light, water and lime, moderately fast to oil and spirit

Soc. Als. Prod. Chim. *BP* 25736/97; *FP* 271908; *GP* 98637

(*Fr.* 5, 67)

Freyss, *Bull. Soc. Ind. Mulhouse*, **70** (1900), 375, 382

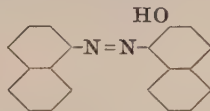
M.p. (from toluene) 229°C

Soluble in hot ethanol (reddish yellow)

Insoluble in hot water

H₂SO₄ conc. — reddish violet; on dilution — reddish yellow ppt.

**12170 C.I. Solvent Red 4 (Yellowish red)
C.I. Pigment Red 40 (Bright bluish red)**



1-Naphthylamine → 2-Naphthol

H₂SO₄ conc. — reddish blue; on dilution — reddish violet solution, then reddish brown ppt.

Ethanol solution + HCl conc. — dull red;

+ NaOH conc. — bright reddish brown

Discoverer — H. Caro 1878

Badische Co., USP 204799; *GP* 5411 (*Fr.* 1, 358)

Meldola & Hanes, *JCS*, **65** (1894), 837

BIOS 1661, 13

FIAT 764 — Autolrot RLP

Willm, *Bull. Soc. Ind. Mulhouse*, **72** (1906), 60, 75

Koechlin, *Rev. Gén. Mat. col.* **10** (1906), 166

Schmidt, *Bull. Soc. Ind. Mulhouse*, **72** (1906), 216

Grandmougin, *Rev. Gén. Mat. col.* **11** (1907), 235

Starck, *Z. Farb.-Ind.* (1908), 355

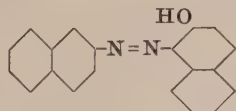
Montavon, *Rev. Gén. Mat. col.* **24** (1920), 91

Rowe & Levin, *JSDC*, **40** (1924), 226

M.p. (from toluene) 224°C (bronze plates)

Soluble in hot ethanol and in benzene (red)

12175 C.I. Solvent Orange 8 (Reddish orange)*



2-Naphthylamine → 2-Naphthol

* In mineral oil

Discoverers — R. Nietzki and O. Goll 1886 (in substance)

Köchlin (Griesheim-Elektron) 1888 (on the fibre)

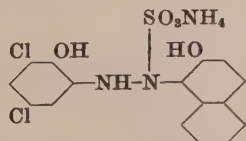
M.L.B., *BP* 29067 (*Fr.* 1, 549)

Nietzki & Goll, *Ber.* **19** (1886), 1282

M.p. 176°C (reddish brown needles)

H₂SO₄ conc. — magenta red; on dilution — reddish brown ppt.

12190 Ingrain Dye



2-Amino-4,6-dichlorophenol → 2-Naphthol;

then treat with ammonium bisulfite

Discoverer — A. Spiegel 1883

Azarine S (MLB)

Used in calico printing, the shade being developed by steaming, boiling with water, or by alkalies. Bright pink and red shades fast to light

Also for dyeing silk and cotton, for shades fast to washing but not to light

M.L.B., *BP* 5767/83; USP 302790–1, 306546; *FP* 159604; *GP* 29067 (*Fr.* 1, 549)

Knecht, *JSDC*, **1** (1885), 266

Spiegel, *Ber.* **18** (1885), 1479

Reber, *JSDC*, **2** (1886), 163

Slightly soluble in water (yellow)

Soluble in ethanol (dark yellow)

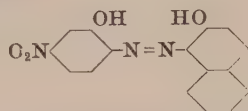
H₂SO₄ conc. — magenta red; on dilution — reddish brown ppt.

HCl — orange yellow ppt.

NaOH — violet ppt; red solution on boiling

12195 C.I. Acid Black 63 (Bluish grey)

A chromium complex of



2-Amino-5-nitrophenol → 2-Naphthol;
then convert to the chromium complex containing 1 atom of chromium to
2 mol. monoazo dye

Discoverer — P. Griess 1878 (unmetallised dye)

BIOS 961, 95

FIAT 1313, 3, 135

Griess, *GP* 3224 (*Fr.* 1, 355)

A component of C.I. Solvent Black 35

12196 C.I. Solvent Violet 1 (Dull bluish violet)

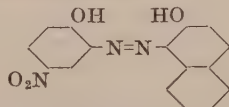
Cobalt analogue of C.I.12195

BIOS 961, 95

FIAT 1313, 3, 135

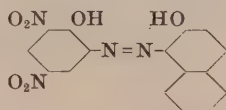
12197 C.I. Acid Brown 29 (Reddish Brown)

A chromium complex derived from



2-Amino-4-nitrophenol → 2-Naphthol;
then convert to the chromium complex

A component of C.I. Solvent Black 35

12200 C.I. Mordant Black 19 (Bluish grey)

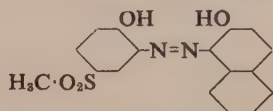
Picramic acid → 2-Naphthol

Discoverer — P. Griess 1878

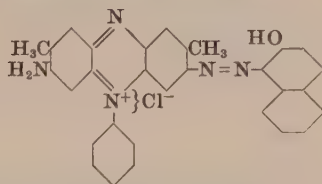
Griess, *GP* 3224 (*Fr.* 1, 355)

Soluble in hot water (reddish brown) and ethanol (bright violet);

Insoluble in benzene

 H_2SO_4 conc. — violet; on dilution — reddish brown ppt. HNO_3 conc. — red solution, becoming pale yellow HCl conc. — reddish brown ppt.**12205 C.I. Acid Violet 78 (Dull violet)**

2:1 Chromium complex of 2-amino-4-(methylsulfonyl)-
phenol → 2-naphthol

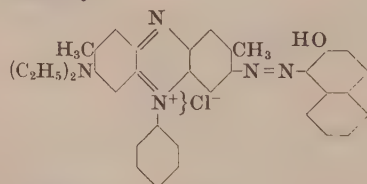
12210 C.I. Basic Blue 16 (Reddish navy)

Tolusafranine (C.I.50240) → 2-Naphthol

Discoverers — E. Kegel 1886; P. Julius 1891

GP ap. L3337, L3377Badische Co., *BP* 4543/91; *USP* 524251; *FP* 212276; *GP* 61692 (*Fr.* 3, 794)*BP* 18769/93; *USP* 524254; *GP* 85690 (*Fr.* 4, 806)Cassella Co., *BP* 3488/95; *FP* 245239; *GP* 85932 (*Fr.* 4, 804)Wülfig, Dahl, *FP* 250239; *GP* 91721 (*Fr.* 4, 807)M.L.B., *GP* 92015 (*Fr.* 4, 808); *BP* 23985/98; *FP* 283013;*GP* 105433 (*Fr.* 5, 538)*FP* 285360; *GP* 108497 (*Fr.* 5, 540)Bayer Co., *GP* 95483 (*Fr.* 5, 535)*Mon. sci.* 16 [3] (1886), 982*JSDC*, 10 (1894), 150; 14 (1898), 126, 230Knecht, *JSDC*, 21 (1905), 294Kallab, *Bull. Soc. Ind. Mulhouse*, 87 (1921), 287

Soluble in water (violet) and ethanol (bluish violet)

 H_2SO_4 conc. — greenish brown; on dilution — green solution, then violet ppt.Aqueous solution + HCl — blue ppt;+ NaOH — blackish violet ppt.**12211 Basic Dye***N,N*-Diethyltolusafranine → 2-Naphthol

Patents and other literature — as for C.I.12210

Janus Blue G (MLB)

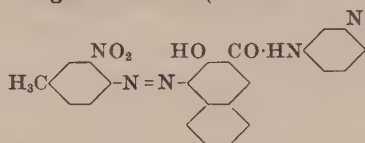
FIAT 764 — Janusblau G

C.I.135 (1st Ed.) — the constitution given was apparently
incorrect for Janus Blue G but some closely related commer-
cial dyes may have the constitution

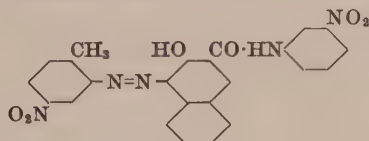
| | |
|---|---|
| 12300 C.I. Pigment Red 21 (Bright yellowish red) | <i>Discoverers</i> — A. Winther, A. Laska and A. Zitscher 1911 Griesheim-Elektron, <i>BP</i> 6379/12; <i>USP</i> 1034853; <i>FP</i> 441333; <i>GP</i> 256999 (<i>Fr.</i> 11, 462) <i>BIOS</i> 1661, 126 <i>FIAT</i> 764 — Permanentrot FR ex. Plv. Rowe & Levin, <i>JSDC</i> , 40 (1924), 228 |
| | M.p. (from toluene) 241°C — orange red needles |
| <i>o</i> -Chloroaniline → 3-Hydroxy-2-naphthanilide | |
| 12305 C.I. Pigment Orange 24 (Orange) | <i>Discoverers</i> — A. Winther, A. Laska and A. Zitscher 1911 Patents as for C.I.12300 <i>BIOS</i> 1661, 124 <i>FIAT</i> 764 — Permanentorange GTR Tg. Koch & Milligan, <i>Anal. Chem.</i> 19 (1947), 312 |
| | |
| <i>m</i> -Chloroaniline → 3-Hydroxy-2-naphthanilide (In Permanent Orange GTR the <i>m</i> -Chloroaniline contains 2% of aniline) | M.p. 256–258°C (Koch & Milligan) |
| 12310 C.I. Pigment Red 2 (Yellowish red, tint Pink) | <i>Discoverers</i> — A. Winther, A. Laska and A. Zitscher 1911 Patents as for C.I.12300 <i>BIOS</i> 961, 140. <i>BIOS</i> 1661, 129 <i>FIAT</i> 764 — Permanentrot FRR ex. Plv. Rowe & Dangerfield, <i>JSDC</i> , 52 (1936), 53 Koch & Milligan, <i>Anal. Chem.</i> 19 (1947), 312 M.p. 310–311°C (Koch & Milligan) H ₂ SO ₄ conc. — reddish violet; on dilution — orange red HNO ₃ conc. — bluish scarlet NaOH — unchanged |
| | |
| 2,5-Dichloroaniline → 3-Hydroxy-2-naphthanilide | |
| 12315 C.I. Pigment Red 22 (Red) | <i>Discoverers</i> — A. Winther, A. Laska and A. Zitscher 1911 Patents as for C.I.12300 |
| | |
| 5-Nitro- <i>o</i> -toluidine → 3-Hydroxy-2-naphthanilide | |
| 12320 C.I. Pigment Red 32 (Bluish red)* | <i>Discoverer</i> — E. Fischer 1933 I.G., <i>USP</i> 2006211; <i>FP</i> 768978; <i>GP</i> 602064 (<i>Fr.</i> 21, 854) <i>BIOS</i> 1661, 161 <i>FIAT</i> 764 — Vulcanechtrubin RF (error for BF) |
| | |
| 3-Amino- <i>p</i> -anisilide → 3-Hydroxy-2-naphthanilide | |
| * In rubber | |
| 12321 C.I. Pigment Violet 25 (Bright violet) | |
| | |
| 4'-Amino-2',5'-dimethoxybenzanilide → 3-Hydroxy-2-naphthanilide | |
| 12330 C.I. Pigment Red 30 (Red)* | <i>Discoverer</i> — E. Fischer 1933 I.G., <i>USP</i> 2006211; <i>FP</i> 768978; <i>GP</i> 602064 (<i>Fr.</i> 21, 854) <i>BIOS</i> 1661, 157 <i>FIAT</i> 1331, 3, 493 — Vulcan Fast Pink GF |
| | |
| 3-Amino- <i>p</i> -tolu-2,4-xylylide → 4'-Chloro-3-hydroxy-2-naphthanilide | |
| * In rubber | |
| 12335 C.I. Pigment Red 8 (Yellowish red, tint Bluish pink) | <i>Discoverers</i> — A. Winther, A. Laska and A. Zitscher 1911 Griesheim-Elektron, <i>BP</i> 6379/12; <i>USP</i> 1034853; <i>FP</i> 441333; <i>GP</i> 256999 (<i>Fr.</i> 11, 462) <i>BIOS</i> 961, 141. <i>BIOS</i> 1661, 130 <i>FIAT</i> 764 — Permanentrot F4R ex. |
| | |
| 5-Nitro- <i>o</i> -toluidine → 4'-Chloro-3-hydroxy-2-naphthanilide | H ₂ SO ₄ conc. — yellowish scarlet; on dilution — scarlet ppt. HNO ₃ conc. — bluish scarlet NaOH — unchanged |

12350 C.I. Pigment Red 18 (Bluish red → Dull red)

Discoverers — A. Winther, A. Laska and A. Zitscher 1911
 Patents as for C.I.12335



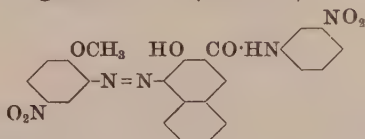
2-Nitro-*p*-toluidine → 3-Hydroxy-3'-nitro-2-naphthanilide

12351 C.I. Pigment Red 114 (Bluish red)

5-Nitro-*o*-toluidine → 3-Hydroxy-3'-nitro-2-naphthanilide

12355 C.I. Pigment Red 23 (Bluish red)

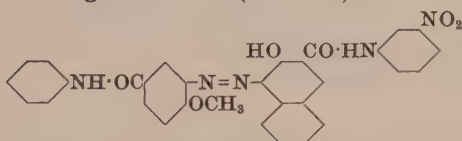
Discoverers — A. Winther, A. Laska and A. Zitscher 1911
 Patents as for C.I.12335



5-Nitro-*o*-anisidine → 3-Hydroxy-3'-nitro-2-naphthanilide

12360 C.I. Pigment Red 31 (Bluish red)*

Discoverer — E. Fischer 1933
 I.G., USP 2006211; FP 768978; GP 602064 (Fr. 21, 854)
 BIOS 1661, 155
 FIAT 764 — Vulcanechtbordo BF
 FIAT 1313, 2, 279

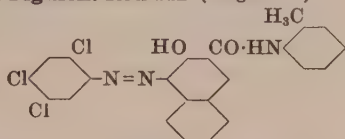


3-Amino-*p*-anisidine → 3-Hydroxy-3'-nitro-2-naphthanilide

* In rubber

12370 C.I. Pigment Red 112 (Bright red)

BIOS 1661, 134
 BIOS 1313, 3, 213

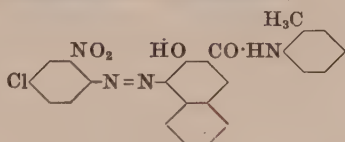


2,4,5-Trichloroaniline → 3-Hydroxy-2-naphtho-*o*-toluidide

H₂SO₄ conc. — reddish violet; on dilution — bluish pink

12380 C.I. Pigment Red 14 (Bluish red)

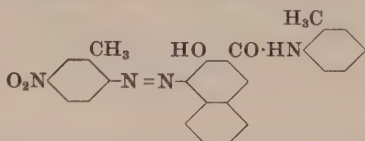
I.G., BP 199771 (revoked); FP 549020; GP 421205 (Fr. 14, 1490)



4-Chloro-2-nitroaniline → 3-Hydroxy-2-naphtho-*o*-toluidide

12385 C.I. Pigment Red 12 (Bluish red, tint Reddish violet)

Patents as for C.I.12380
 BIOS 1661, 114
 FIAT 764 — Permanentbordo FRR ex. Plv.

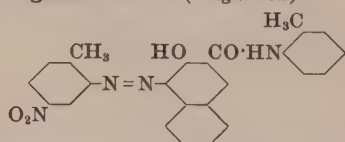


4-Nitro-*o*-toluidine → 3-Hydroxy-2-naphtho-*o*-toluidide

H₂SO₄ conc. — reddish violet; on dilution — red ppt.
 HNO₃ conc. — scarlet solution
 NaOH — unchanged

12390 C.I. Pigment Red 17 (Bright red)

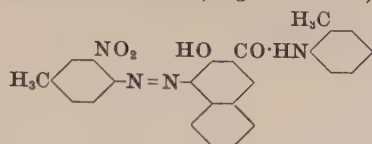
Patents as for C.I.12380



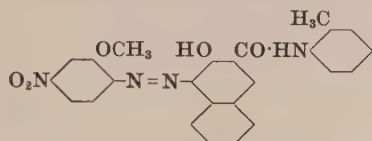
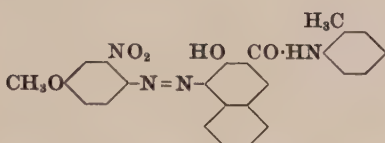
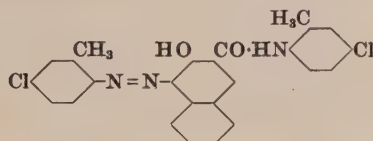
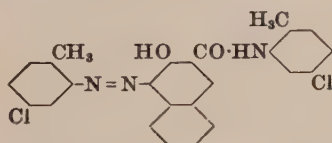
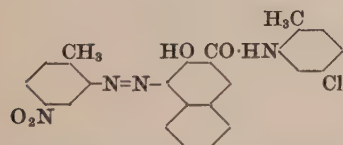
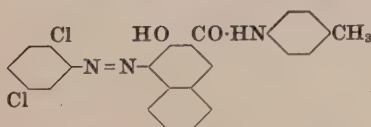
5-Nitro-*o*-toluidine → 3-Hydroxy-2-naphtho-*o*-toluidide

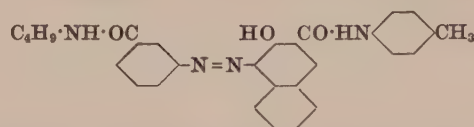
12395 C.I. Pigment Red 13 (Bright bluish red)

Patents as for C.I.12380

2-Nitro-*p*-toluidine → 3-Hydroxy-2-naphtho-*o*-toluidide**12400 C.I. Pigment Red 19 (Brownish red → Reddish brown)**

Patents as for C.I.12380

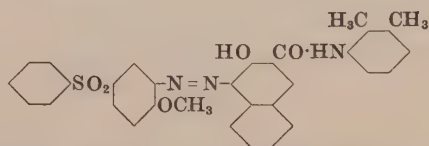
4-Nitro-*o*-anisidine → 3-Hydroxy-2-naphtho-*o*-toluidide**12405 Pigment****Bordeaux B (MLB)**Patents as for C.I.12380
FIAT 764 — Bordopigment
BIOS 1661, 142-Nitro-*p*-anisidine → 3-Hydroxy-2-naphtho-*o*-toluidide**12420 C.I. Pigment Red 7 (Red, tint Bluish pink)***Discoverer* — H. Wagner 1921Patents as for C.I.12380
FIAT 764 — Permanentrot F4RH ex. Plv.
BIOS 1661, 131
Saunders, *JSDC*, **40** (1924), 48
Rowe & Levin, *JSDC*, **42** (1926), 824-Chloro-*o*-toluidine → 4'-Chloro-3-hydroxy-2-naphtho-*o*-toluidideM.p. (from toluene) 285°C — needles
H₂SO₄ conc. — magenta red; on dilution — crimson ppt.
HNO₃ conc. — yellow solution
NaOH — unchanged**12430 C.I. Pigment Red 11 (Bright bluish red, tint Reddish violet)***Discoverer* — H. Wagner 1921Patents as for C.I.12380
FIAT 764 — Permanentrubin FBH
BIOS 1661, 1435-Chloro-*o*-toluidine → 5'-Chloro-3-hydroxy-2-naphtho-*o*-toluidide**12431 C.I. Pigment Red 162 (Yellowish red)**5-Nitro-*o*-toluidine → 5'-Chloro-3-hydroxy-2-naphtho-*o*-toluidide**12440 C.I. Pigment Red 10 (Yellowish red, tint Pink)***Discoverers* — A. Winther, A. Laska and A. Zitscher 1921
Griesheim-Elektron, *BP* 6379/12; *USP* 1034853; *FP* 441333;
GP 256999 (*Fr.* **11**, 462)
FIAT 764 — Permanentrot FRL ex. Plv.
BIOS 961, 139. *BIOS* 1661, 1272,5-Dichloroaniline → 3-Hydroxy-2-naphtho-*p*-toluidideM.p. 295°C
H₂SO₄ conc. — reddish violet; on dilution — orange red ppt.
HNO₃ conc. — yellowish scarlet becoming yellow
NaOH — unchanged

12445 Pigment

m-Amino-*N*-butylbenzamide → 3-Hydroxy-2-naphtho-*p*-toluidide

Permanent Scarlet R (IG)

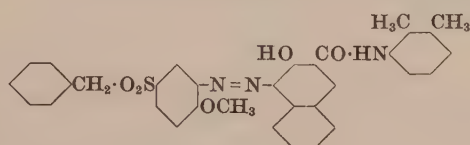
Used for pigment printing
FIAT 1313, 3, 213

12450 Pigment

5-Phenylsulfonyl-*o*-anisidine → 3-Hydroxy-2-naphtho-2,3-xylidide

Lithol Fast Red Toner B (IG)

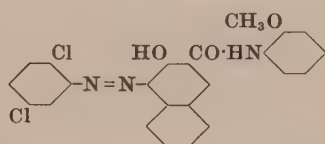
Used in lacquer enamels
BIOS 1661, 95
FIAT 1313, 3, 486

12455 C.I. Pigment Red 163

5-Benzylsulfonyl-*o*-anisidine → 3-Hydroxy-2-naphtho-2,3-xylidide

Lithol Fast Red Toner R (IG)

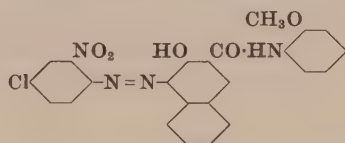
Used in printing inks
FIAT 1313, 3, 488
BIOS 1661, 97

12460 C.I. Pigment Red 9 (Yellowish red, tint Pink)

2,5-Dichloroaniline → 3-Hydroxy-2-naphtho-*o*-anisidine

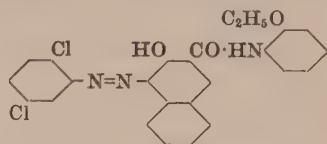
Discoverers — A. Laska and A. Zitscher 1922
Griesheim-Elektron, *USP* 1457114; *GP* 390627 (*Fr.* 14, 1022)
BIOS 1661, 128
FIAT 764 — Permanentrot FRLI ex. Plv.
Rowe, *JSDC*, 46 (1930), 227

M.p. (from toluene) 280°C — fine scarlet needles with golden lustre

12465 C.I. Pigment Red 15 (Dull bluish red)

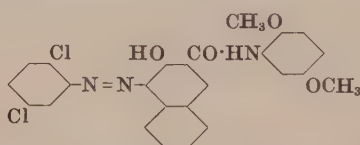
4-Chloro-2-nitroaniline → 3-Hydroxy-2-naphtho-*o*-anisidine

Discoverers — A. Laska and A. Zitscher 1922
Patents as for C.I.12460

12470 C.I. Pigment Orange 22 (Reddish orange)

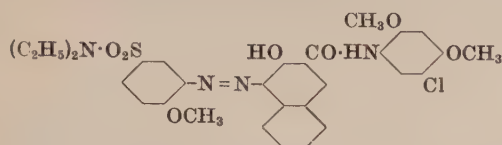
2,5-Dichloroaniline → 3-Hydroxy-2-naphtho-*o*-phenetidide

Discoverer—Chevakol
Versal Orange G R (Chem)

12480 C.I. Pigment Brown 1 (Reddish brown)

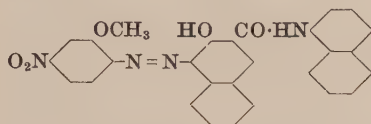
2,5-Dichloroaniline → 3-Hydroxy-2',5'-dimethoxy-2-naphthanilide

Discoverers — A. Laska and A. Zitscher 1922
Patents as for C.I.12460
BIOS 1369, 44. *BIOS* 1661, 120
FIAT 764 — Permanentbraun FG ex. Plv.

12490 C.I. Pigment Red 5 (Bright red)

*N*¹,*N*¹-Diethyl-4-methoxymetanilamide
→ 5'-Chloro-3-hydroxy-2',4'-dimethoxy-2-naphthanilide

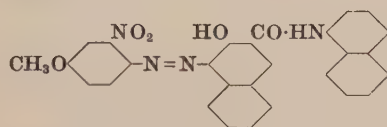
Discoverers — W. Neelmeier and W. Lamberg 1931
I.G., BP 391468; FP 742326; GP 575216 (*Fr.* 19, 1613)
BIOS 1661, 121
FIAT 764 — Permanentcarmin FB ex. Plv.

12500 C.I. Pigment Red 16 (Bluish red)

4-Nitro-*o*-anisidine → 3-Hydroxy-*N*-1-naphthyl-2-naphthamide

Discoverers — A. Winther, A. Laska and A. Zitscher 1911
Griesheim-Elektron, BP 6379/12; USP 1034853; FP 441333;
GP 256999 (*Fr.* 11, 462)
BIOS 1661, 116
FIAT 764 — Permanentbordo F3R ex. Plv.

M.p. (from toluene) 315°C; red needles with bronze lustre
H₂SO₄ conc. — red (bluish fluorescence); on dilution — red ppt.

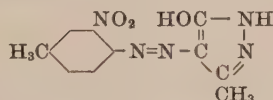
12505 Pigment

2-Nitro-*p*-anisidine → 3-Hydroxy-*N*-1-naphthyl-2-naphthamide

Permanent Violet FR (IG)

Pigment for printing inks and oil paints; very good fastness to light, water and heat; moderate to good fastness to oil

BIOS 1661, 144 (formula incorrect, *see* PB 74713)
FIAT 764 — Permanentviolett FR ex. Plv.

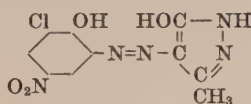
12690 C.I. Disperse Yellow 8 (Bright yellow)

2-Nitro-*p*-toluidine → 3-Methyl-5-pyrazolone

Discoverers — G. de Montmollin and M. Schmid 1926
CIBA, BP 282782; USP 1828599; FP 646061; GP 561493 (*Fr.* 18, 1092); *SwP* 127260, 129473

12695 C.I. Acid Orange 98 (Dull orange)

A 2:1 chromium complex of

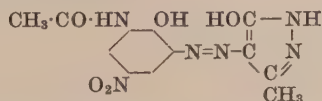


2-Amino-6-chloro-4-nitrophenol → 3-Methyl-5-pyrazolone;
then convert to the chromium complex

Soluble in water (yellowish orange)
Moderately soluble in ethanol (orange)
H₂SO₄ conc. — orange; on dilution — orange
Aqueous solution + HCl — yellowish orange (reddish orange precipitate); + NaOH — scarlet

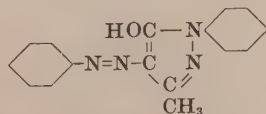
12696 C.I. Acid Orange 99 (Reddish orange)

A 2:1 chromium complex of



2-Acetamido-6-amino-4-nitrophenol → 3-Methyl-5-pyrazolone;
then convert to the chromium complex

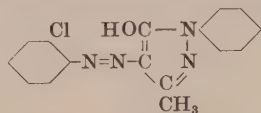
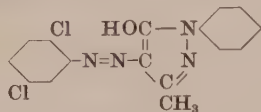
Soluble in water, slightly soluble in ethanol (reddish orange)
H₂SO₄ conc. — dull yellow; on dilution — orange
Aqueous solution + HCl — orange precipitate; + NaOH — red

**12700 C.I. Disperse Yellow 16 (Yellow)
C.I. Solvent Yellow 16 (Bright greenish yellow)**

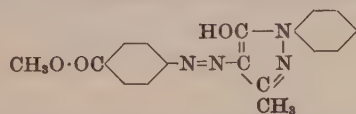
Aniline → 3-Methyl-1-phenyl-5-pyrazolone

Discoverer — L. Knorr 1887
Brit. Celanese, BP 224681; USP 1600277
FIAT 764 — Sudangelb 3G
Knorr, *Ann.* 238 (1887), 183

M.p. 155°C
Soluble in ethanol and carbon tetrachloride
H₂SO₄ conc. — greenish yellow; on dilution — greenish yellow, then orange yellow, then yellow ppt.
HCl conc. (warm) — slightly soluble (orange)
NaOH 5% (warm) — slightly soluble (yellow)

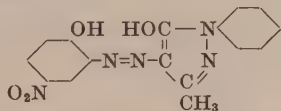
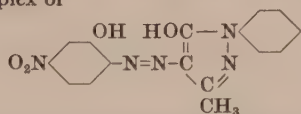
12705 C.I. Pigment Yellow 60 (Bright reddish yellow)Burr & Rowe, *JSDC*, **44** (1928), 205
M.p. 188°C (from glacial acetic acid)*o*-Chloroaniline → 3-Methyl-1-phenyl-5-pyrazolone**12710 C.I. Pigment Yellow 10 (Reddish yellow)**BIOS 1661, 65
FIAT 764 — Hansa Yellow R
Fierz-David & Ziegler, *Helv. Chim. Acta*, **11** (1928), 785

2,5-Dichloroaniline → 3-Methyl-1-phenyl-5-pyrazolone

Insoluble in water
Slightly soluble in ethanol
M.p. 228°C**12712 C.I. Disperse Yellow 60 (Reddish yellow)**Karrer, *Lehrbuch der organischen Chemie*, 13th Edit., p. 520*p*-Aminobenzoic acid, methyl ester → 3-Methyl-1-phenyl-5-pyrazolone**12714 C.I. Solvent Orange 62 (Reddish orange)
C.I. Acid Orange 92**

A component of C.I. Solvent Red 142

A chromium complex of

2-Amino-4-nitrophenol → 3-Methyl-1-phenyl-5-pyrazolone;
then convert to the chromium complex**12715 C.I. Solvent Red 8 (Bright bluish red)
A chromium complex of**Discoverers — H. Krzikalla and W. Müller 1926
I.G., *BP* 272908; *USP* 1693448; *FP* 658253; *GP* 479373 (*Fr.* **16**, 975)
BIOS 961, 95 — Perlon Fast Red B, G
FIAT 764 — Zaponechtrot BE
FIAT 1313, **3**, 135
A component of C.I. Solvent Red 1422-Amino-5-nitrophenol → 3-Methyl-1-phenyl-5-pyrazolone;
then heat with chromium formate in formamide solution for 4–5 hr. at 110°C to convert to the chromium complex containing 2 mol. monoazo dye to 1 atom of chromium

Note — In Perlon Fast Red G (IG) and Zapon Fast Red GE (IG) part of the 2-amino-5-nitrophenol was replaced by 2-amino-4-nitrophenol

Soluble in ethanol
Slightly soluble in ethyl acetate**12716 C.I. Solvent Red 100 (Red)**

The 1:2 chromium complex formed from equimolecular proportions of C.I. 12715 and the isomeric dye prepared from 2-amino-4-nitrophenol

2-Amino-4-nitrophenol

→ 3-Methyl-1-phenyl-5-pyrazolone (1 mol.), and

2-Amino-5-nitrophenol → 3-Methyl-1-phenyl-5-pyrazolone (1 mol.);

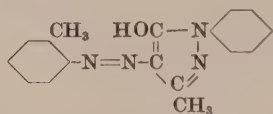
then convert to the chromium complex

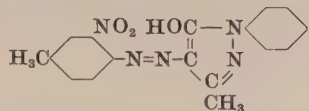
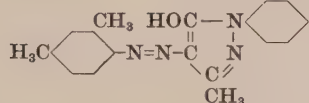
12720 Pigment

Discoverer — M.L.B. 1904

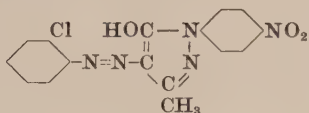
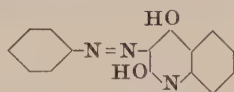
Pigment Chrome Yellow L paste (MLB)

Pigment for wallpapers. Very good fastness to light and oil; good fastness to water and lime. Non-poisonous substitute for Chrome Yellow

M.L.B., *FP* 350431; *GP ap.* F18913 (*Fr.* **8**, 732)
Rowe & Dangerfield, *JSDC*, **52** (1936) 53*o*-Toluidine → 3-Methyl-1-phenyl-5-pyrazoloneSoluble in ethanol (orange yellow)
Insoluble in water
H₂SO₄ conc. — orange; on dilution — orange yellow ppt.

12730 C.I. Pigment Orange 6 (Dull reddish orange)2-Nitro-*p*-toluidine → 3-Methyl-1-phenyl-5-pyrazoloneSoluble in ethanol, xylene and Cellosolve
Insoluble in water**12740 C.I. Solvent Yellow 18 (Bright yellow
→ Bright reddish yellow)****C.I. Food Yellow 12 (Bright yellow
→ Bright reddish yellow)**

2,4-Xylidine → 3-Methyl-1-phenyl-5-pyrazolone

Brit. Celanese, *BP* 224681; *USP* 1600277
FIAT 764 — Sudangelb G
Cross, *JSDC*, **61** (1945), 75Insoluble in water
Slightly soluble in ethanol**12750 Pigment***o*-Chloroaniline → 3-Methyl-1-(*p*-nitrophenyl)-5-pyrazolone*Discoverer* — H. Geldermann 1910**Permanent Yellow R (A)**Agfa, *USP* 988870Burr & Rowe, *JSDC*, **44** (1928), 205Slightly soluble in benzene (reddish yellow)
M.p. 263°C (from glacial acetic acid)
H₂SO₄ conc. — yellow; on dilution — yellow flakes**12770 C.I. Disperse Yellow 4 (Bright greenish yellow)**

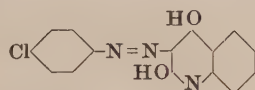
Aniline → 2,4-Quinolinediol

Discoverer — E. Fussenegger 1905Badische Co., *BP* 11205/05; *USP* 806077; *GP* 165327 (*Fr.* **8**, 718)Brit. Dye Corp., *BP* 236037Rowe, *RIC Lectures*, 36Green, *Thorpe*, **1**, 41For preparation of coupling component *see* —
GP 117167 (*Fr.* **6**, 1224)

Soluble in ethanol, acetone and toluene

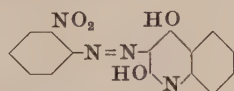
12775 C.I. Pigment Green 10 (Yellowish green)

Nickel complex of

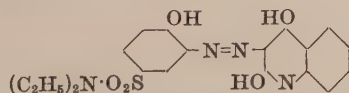
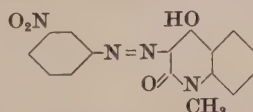
*p*-Chloroaniline → 2,4-Quinolinediol;
then convert to the nickel complex*Discoverers* — E. Fussenegger 1905 (unmetalised dye)

D. E. Kvalnes and H. E. Woodward 1946

(nickel complex)

Badische Co., *BP* 11205/05; *USP* 806077; *GP* 165327 (*Fr.* **8**, 718)Du Pont Co., *USP* 2396327Very slightly soluble in ethanol
Insoluble in water**12780 C.I. Pigment Yellow 7 (Bright reddish yellow)***o*-Nitroaniline → 2,4-Quinolinediol*BIOS* 1661, 145*FIAT* 764 — Permanentgelb NCR Plv.Insoluble in water
Very slightly soluble in ethanol, Cellosolve and xylene**12783 C.I. Solvent Red 99 (Yellowish red)**

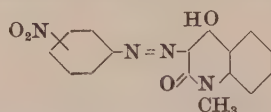
The 1:1 chromium complex of

2-Amino-*N,N*-diethyl-1-phenol-4-sulfonamide → 2,4-Quinolinediol;
then convert to the chromium complex**12790 C.I. Disperse Yellow 5 (Greenish yellow)***m*-Nitroaniline → 4-Hydroxy-1-methylcarbostryl*Discoverers* — K. Holzach and G. F. von Rosenberg 1928I.G., *BP* 327394; *USP* 1969463-4; *FP* 677491; *GP* 541072
(*Fr.* **18**, 1082)*BIOS* 961, 79; *BIOS* 1548, 197*FIAT* 764 — Cellitongelb 5GSoluble in ethanol, acetone, benzene, Cellosolve and carbon
tetrachloride

Slightly soluble in Stoddart solvent

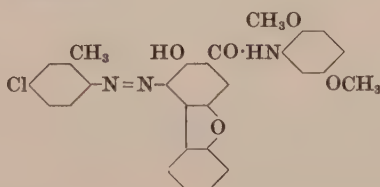
H₂SO₄ conc. — golden yellow; on dilution — yellowHNO₃ conc. — unaltered

NaOH conc. — orange yellow solution

12795 C.I. Disperse Yellow 10 (Bright greenish yellow)

Discoverers — K. Holzach and G. F. von Rosenberg 1928
 I.G., BP 327394; USP 1969463-4; FP 677491; GP 541072
 (Fr. 18, 1082)
 BIOS 961, 79. BIOS 1548, 198
 FIAT 764 — Cellitongelb 3GN

o- and *p*-Nitroanilines (in molecular proportions 31/69)
 → 4-Hydroxy-1-methylcarbostyryl

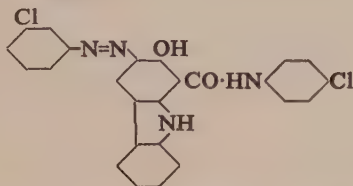
12800 Pigment

Discoverer — F. Muth 1932

Permanent Brown B (IG)

Pigment for textile printing compositions
 I.G., BP 426564; USP 2026908; FP 768053; GP 594326 (Fr. 20, 1125)
 FIAT 1313, 3, 215

4-Chloro-*o*-toluidine
 → 2-Hydroxy-2',5'-dimethoxy-3-dibenzofurancarboxanilide

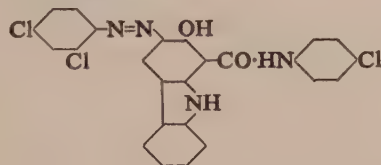
12810 Pigment

Discoverers — A. Schmelzer, F. Ballauf and F. Muth 1928

Spinning Khaki GV (IG)

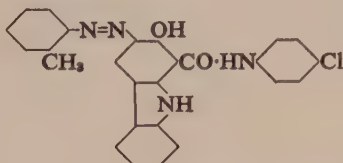
Pigment for mass coloration of viscose rayon
 I.G., BP 343164; USP 1919573; FP 684682; GP 551880 (Fr. 19, 1627)
 BIOS MISC 20, Appendix No. 71
 FIAT 1313, 3, 381

m-Chloroaniline → 4'-Chloro-2-hydroxy-1-carbazolecarboxanilide

12815 Pigment**Spinning Brown GA (IG)**

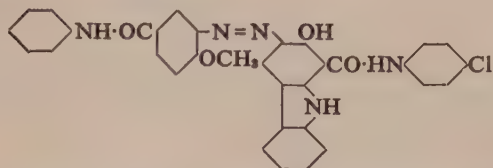
Pigment for mass coloration of acetate rayon
 I.G., BP 343164; USP 1919573; FP 684682; GP 551880 (Fr. 19, 1627)
 FIAT 764 — Spinnbraun GA
 FIAT 1313, 3, 382

2,4-Dichloroaniline → 4'-Chloro-2-hydroxy-1-carbazolecarboxanilide

12820 Pigment**Spinning Brown RA (IG)**

Pigment for mass coloration of acetate rayon
 I.G., BP 343164; USP 1919573; FP 684682; GP 551880 (Fr. 19, 1627)
 FIAT 764 — Spinnbraun RA

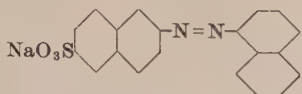
o-Toluidine → 4'-Chloro-2-hydroxy-1-carbazolecarboxanilide

12825 Pigment**Spinning Brown 5RV (IG)**

Pigment for mass coloration of viscose rayon
 I.G., BP 343164; USP 1919573; FP 684682; GP 551880 (Fr. 19, 1627)
 FIAT 764 — Spinnbraun 5RV fein f. Plv. 30%
 FIAT 1313, 3, 381

3-Amino-*p*-anisilide → 4'-Chloro-2-hydroxy-1-carbazolecarboxanilide

Note — For certain other examples of water-insoluble monoazo dyes derived from heterocyclic coupling components
 see C.I.11410, 11420, 11430, 11435

13000 C.I. Acid Brown 8 (Brown)

Broenner's acid → 1-Naphthylamine;

then diazotise and warm with ethanol and sodium carbonate to remove the amino group

Discoverer — E. Frank (Bayer Co.) 1891

FIAT 764 — Azosaeurebraun

Not very soluble in water (yellowish brown)

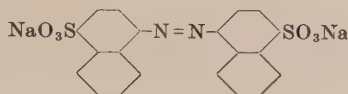
Soluble in ethanol (yellowish brown)

H₂SO₄ conc. — dark blue (+ violet and magenta); on dilution — brown

Aqueous solution + HCl conc. — yellowish olive brown;
+ NaOH conc. — orange brown

13001 Acid Dye

Dye of possible constitution



Diazotise naphthionic acid, add sodium acetate or sodium carbonate and then, slowly, an aqueous solution of sodium sulfite

Discoverer — Lange 1894

Cuba Orange (FA)

Dyes wool from an acid dyebath

GP 78225 (Fr. 4, 1016)

Hantzsch & Schmiedel, Ber. 30 (1897), 81

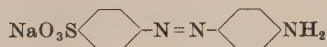
Soluble in hot water (orange)

Very slightly soluble in ethanol

H₂SO₄ conc. — blue; on dilution — orange solution and yellowish ppt.

Aqueous solution + HCl — orange;

+ NaOH — yellow crystalline ppt.

13010 Acid Dye

(a) Sulfonate *p*-phenylazoaniline (C.I.11000) and separate the mixture of mono and disulfonic acids, or

(b) Sulfanilic acid → Anilinomethanesulfonic acid; then heat in dilute caustic alkaline medium to remove the methanesulfonic acid group

To make anilinomethanesulfonic acid treat aniline with an aqueous solution of sodium bisulfite and formaldehyde

Discoverers — Badische Co.; F. Grässler 1878

New Yellow GMF (B)

Grässler, BP 43/79; USP 253598; FP 128113; GP 4186, 7094, 9384, (Fr. 1, 439-41)

Prud'homme, GP ap. P9784 (Fr. 5, 66)

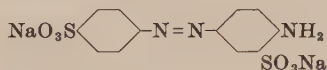
Agfa, BP 11343/99; GP 131860 (Fr. 6, 872)

Prud'homme, Mon. sci. 14 [4] (1900), 366

Soluble in water (yellow)

H₂SO₄ conc. — dull yellow; on dilution — orange, then light brown ppt.

Used in the manufacture of disazo and trisazo dyes (see *p*-(*p*-aminophenylazo)benzenesulfonic acid)

**13015 C.I. Acid Yellow 9 (Reddish yellow)
C.I. Food Yellow 2**

Disulfonate *p*-phenylazoaniline (C.I.11000)

Used also as an intermediate in the manufacture of disazo and trisazo dyes (see 6-amino-3,4'-azodibenzene sulfonic acid)

Discoverers — Köhler 1877; F. Grässler 1878

Grässler, BP 43/79; USP 253598; FP 128113; GP 4186, 7094, 9384, (Fr. 1, 439-441)

FIAT 764 — Echtgelb ex.

Griess, Ber. 9 (1876), 630; 15 (1882), 2187

Nietzki, Ber. 13 (1880), 801

Limpricht, Ber. 15 (1882), 1155

Rodatz, Ann. 215 (1882), 213

Janovsky, Mhft. Chem. 4 (1883), 276, 652

Paul, Z. angew. Chem. 1896, 691

Eger, Ber. 22 (1899), 847

Dubský & Okáč, Rec. Trav. Chim. 46 (1927), 296

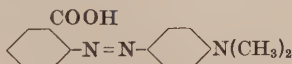
H₂SO₄ conc. — greenish yellow; on dilution — reddish orange

Aqueous solution + HCl conc. — orange red;

+ NaOH conc. — greenish yellow

Soluble in water (greenish yellow)

Slightly soluble in ethanol and Cellosolve

13020 C.I. Acid Red 2

Anthranilic acid → *N,N*-Dimethylaniline

Moderately soluble in ethanol

Insoluble in water

Alcoholic solution + HCl — violet red;

+ NaOH — faint yellow

Discoverers — E. Rupp and R. Loose 1908

Rupp & Loose, Ber. 41 (1908), 3905

Tizard, JCS, 97 (1910), 2485

Palitzsh, Biochem. Z. 37 (1911), 131

Thomson, Analyst, 39 (1914), 518

Kay & Newlands, JSCI, 35 (1916), 445

Desvergnès, Ann. Chim. anal. 2 (1920), 209

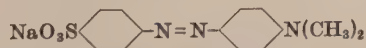
Schorger, Ind. Eng. Chem. 15 (1923), 742

Thiele & Springemann, Z. anorg. Chem. 176 (1928), 64

Whitmore & Revukas, JACS, 59 (1937), 1501

13025 C.I. Acid Orange 52 (Orange)

Classical name Orange III



Sulfanilic acid → *N,N*-Dimethylaniline

Soluble in water (golden yellow)

Insoluble in ethanol

H₂SO₄ conc. — brown; on dilution — magenta red

Aqueous solution + HCl — magenta red solution and reddish brown ppt;

+ NaOH conc. — orange yellow soluble ppt.

Discoverers — P. Griess 1875; O. N. Witt 1876; Z. Roussin 1876

Roussin, USP 210054

BIOS 1548, 44

BIOS 961, 43

FIAT 764 — Methylorange 27117S

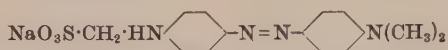
Meyer, Ber. 53 (1920), 1271

Hantzsch, Ber. 62 (1929), 966

Seyewetz & Chaix, Bull. Soc. chim. 41 (1927), 332

Whitmore & Revukas, JACS, 59 (1937), 1501

Cross, JSDC, 61 (1945), 75

13030 Acid Dye

p-Nitroaniline \rightarrow *N,N*-Dimethylaniline;
then reduce the nitro group to amino and treat with formaldehyde and sodium bisulfite

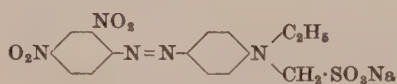
Soluble in water (yellow)
 H_2SO_4 conc. — dull orange

Discoverers — A. G. Green and K. H. Saunders 1922

Ionamine Black A (BDC)

Used for dyeing cellulose acetate giving black on diazotisation and development with 3-hydroxy-2-naphthoic acid

Brit. Dye. Corp., *BP* 197809, 200873, 212029, 212030;
USP 1483797, 1483798; *FP* 563458; *GP* 395636 (*Fr.* 14, 1083)
Green & Saunders, *JSDC*, 39 (1923), 10; 40 (1924), 138
Rowe, *Lecture*, 36
Thorpe, 1, 40
Knight, *JSDC*, 66 (1950), 169

13040 Acid Dye

2,4-Dinitroaniline \rightarrow *N*-Ethylanilinomethanesulfonic acid

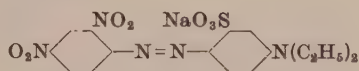
Discoverers — A. G. Green and K. H. Saunders 1922

Ionamine Red KA (BDC)

Used for dyeing cellulose acetate

Patents and references as for C.I.13030

Soluble in water (red)
 H_2SO_4 conc. — bluish red

13050 Acid Dye

2,4-Dinitroaniline \rightarrow *N,N*-Diethylmetanilic acid

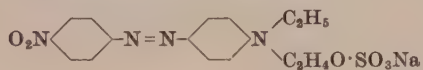
Discoverer — P. Julius 1894

Wool Violet S (B)

Dyes wool from an acid dye bath; very sensitive to acids

Badische Co., *BP* 6197/94; *USP* 525656-7; *FP* 239096; *GP* 86071
(*Fr.* 4, 719)

Soluble in water and ethanol (reddish violet)
 H_2SO_4 conc. — scarlet red; on dilution — orange red
Aqueous solution + HCl — orange red;
+ NaOH — bluish violet ppt.

13055 C.I. Acid Red 53 (Yellowish red)*

p-Nitroaniline \rightarrow 2-(*N*-Ethylanilino)ethanol sulfuric ester

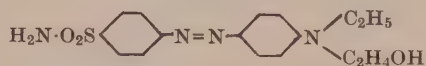
* Dyed on cellulose acetate

Discoverers — A. G. Green and K. H. Saunders, W. G. Perkin and S. C. Bate

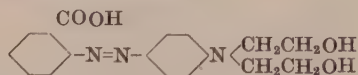
Solacet Fast Scarlet B (ICI)

Brit. Dye. Corp., *BP* 181750, 237739
Knight, *JSDC*, 66 (1950), 172
Mellor & Olpin, *JSDC*, 67 (1951), 621
Darwalla & Turner, *JSDC*, 69 (1953), 242

Soluble in water (red)
 H_2SO_4 conc. — yellowish orange brown

13056 C.I. Disperse Orange 10 (Bright yellowish orange)

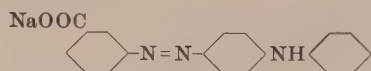
Sulfanilamide \rightarrow 2-(*N*-Ethylanilino)ethanol

Serisol Brilliant Orange N2GD (YDC)**13058 C.I. Pigment Red 100**

Anthranilic acid \rightarrow 2,2'-(Phenylimino)diethanol

Slightly soluble in water
Slightly soluble in ethanol, ether and acetone

H_2SO_4 conc. — brown; on dilution — bright pink solution
 HCl conc. — bright pink solution
 HNO_3 conc. — bright pink solution
 NaOH 10% — yellow solution (incomplete)

13060 Acid Dye

m-Aminobenzoic acid \rightarrow Diphenylamine

Discoverers — Z. Roussin and D. A. Rosenstiehl 1883

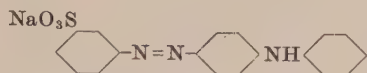
Yellow Fast to Soap (St. D)

Dyes wool from a dye bath containing soap. Used also in calico printing on a chromium mordant to give orange shades fast to washing and of moderate fastness to light

S.A. St. Denis, *BP* 4621/83; *USP* 297852; *FP* 157755; *GP* 29991
(*Fr.* 1, 539)

H_2SO_4 conc. — violet; on dilution — magenta red
Aqueous solution + HCl — reddish violet;
+ NaOH — little change

Slightly soluble in water
Soluble in ethanol

13065 C.I. Acid Yellow 36 (Reddish yellow → Orange)

Metanilic acid → Diphenylamine

Aqueous solution + HCl — magenta red solution and ppt;
+ NaOH — unaltered, yellow ppt. with excess

Discoverers — C. Rumpff 1879; Hepp 1882

Bayer Co., *BP* 1226/79

Oehler, *BP* 4966/80

BIOS 961, 128

FIAT 764 — Metanilgelb ex.

Paul, *Z. angew. Chem.* **9** (1896) 686

Meyer, *Ber.* **53** (1920), 1274

Soluble in water and ethanol (orange yellow)

Moderately soluble in ether, benzene and Cellosolve

Slightly soluble in acetone

H₂SO₄ conc. — violet; on dilution — magenta red solution and ppt.

HNO₃ conc. — blue solution, turning orange

13070 Acid Dye

Bromo derivative of C.I.13065

Treat C.I.13065 with bromine in aqueous solution

H₂SO₄ conc. — violet; on dilution — violet ppt.

Aqueous solution + HCl — violet ppt;

+ NaOH — yellow

Discoverers — D. A. Rosenstiehl and Z. Roussin 1882

Brominated Metanil Yellow (St. D)

Dyes wool from an acid dyebath. Also used for dyeing cotton and paper

S.A. St. Denis, *BP* 5696/82; *USP* 309882; *FP* 140114; *GP* 26642 (*Fr.* **1**, 546)

Soluble in water (orange yellow)

13075 Acid Dye

Sulfonate C.I.13065

Dahl Co., *GP* 21903 (*Fr.* **1**, 442)

Acid Yellow 2G, Metanil Yellow S (Gr E)

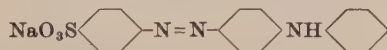
Dyes wool from an acid dyebath, moderate fastness to light and milling

Soluble in water (orange yellow)

H₂SO₄ conc. — violet red; on dilution — yellow brown solution and ppt.

Aqueous solution + HCl — brownish yellow ppt;

+ NaOH — darker

13080 C.I. Acid Orange 5 (Yellowish orange)

Classical name **Orange IV**

Sulfanilic acid → Diphenylamine

(Add the diphenylamine as an emulsion to the diazo compound and stir 40-48 hr. to complete the coupling. The coupling can also be effected in alcoholic solution)

H₂SO₄ conc. — violet; on dilution — violet ppt.

Aqueous solution + HCl — violet ppt;

+ NaOH — yellow ppt.

Discoverers — O. N. Witt 1876; Z. Roussin 1877

Roussin, *USP* 210054

BIOS 961, 45

FIAT 764 — Orange IV

Meyer, *Ber.* **53** (1920), 1273

Seyewetz & Chaix, *Bull. Soc. chim.* **41** (1927), 332

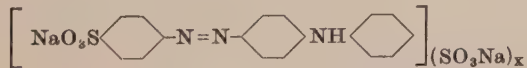
Hodgson, *JSDC*, **58** (1942), 228

Fierz-David & Blangey, 274

Soluble in water and ethanol (orange yellow)

Slightly soluble in ether

Insoluble in benzene

13085 C.I. Acid Yellow 16 (Reddish yellow)

Sulfonate C.I.13080

Dahl & Co., *GP* 21903 (*Fr.* **1**, 442)

Soluble in water (yellow)

Insoluble in ethanol

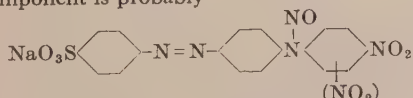
H₂SO₄ conc. — bluish red; on dilution — magenta red

Aqueous solution + HCl — violet red;

+ NaOH — unchanged

13090 C.I. Acid Orange 1 (Yellowish orange)

The main component is probably



Treat C.I.13080 with aqueous sodium nitrite to form the *N*-nitroso derivative then nitrate so as to introduce one to two nitro groups

Aqueous solution + HCl conc. — magenta red solution and blackish brown ppt;

+ NaOH — yellowish brown solution; brown ppt. with excess

Discoverers — E. Knecht 1880; Charvolin 1880; ter Meer 1881

BIOS 961, 15

FIAT 764 — Azoflavin 3R kz.

Paul, *Z. angew. Chim.* (1896), 687

Juillard, *Bull. Soc. chim.* [3] **33** (1905), 974

Maki, *J. Chem. Ind. Tok.* **21** (1918), 1199; **22** (1919), 1

Fierz-David & Blangey, 275

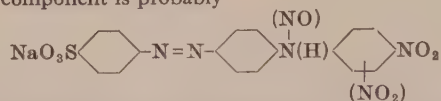
Soluble in water and ethanol (yellowish brown)

Very slightly soluble in acetone and toluene

H₂SO₄ conc. — reddish violet; on dilution — brownish yellow to olive brown ppt.

13091 C.I. Acid Orange 1 (Yellowish orange)

The main component is probably



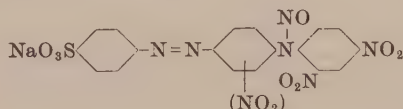
Treat C.I.13090 with sodium bisulfite so as to bring about partial denitrosation

BIOS 961, 16

FIAT 764 — Azoflavin 3R kz. neu

13095 C.I. Acid Yellow 63 (Reddish yellow)

The main component is probably



Treat C.I.13080 with aqueous sodium nitrite to form the *N*-nitroso derivative and then nitrate so as to introduce two to three nitro groups

Discoverers — E. Knecht 1880; Charvolin 1880; ter Meer 1881

BIOS 961, 16, 36

FIAT 764 — Indischgelb G, Azogelb 3G kz.

Juillard, *Bull. Soc. chim.* **11** (1905), 974

Fierz-David & Blangey, 275

Soluble in water (lemon yellow) and ethanol (yellow)

Very slightly soluble in benzene and ether

H₂SO₄ conc. — magenta red; on dilution — yellowish red solution, then yellowish brown ppt.

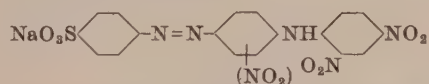
HNO₃ conc. — red solution changing to brown

Aqueous solution + HCl — brown solution and ppt;

+ NaOH — yellowish brown solution, then brownish yellow ppt.

13096 Acid Dye

The main component is probably



Treat C.I.13095 with sodium bisulfite to effect denitrosation

BIOS 961, 16

FIAT 764 — Azogelb 3GNN kz.

13100 C.I. Acid Yellow 6 (Reddish yellow)

(a) Condense *p*-(*p*-aminophenylazo)benzenesulfonic acid with 1-chloro-2,4-dinitrobenzene, or

(b) Condense *p*-phenylazoaniline with 1-chloro-2,4-dinitrobenzene; then sulfonate the product

Discoverers — E. Nölting and E. Salis-Mayenfeld 1882

FP 152106; GP 22268 (*Fr.* **1**, 326)

BIOS 961, 15

FIAT 764 — Azoflavin FFN

Fierz-David & Blangey, 272

Soluble in water (orange yellow)

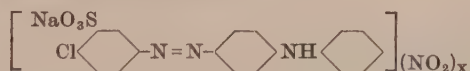
H₂SO₄ conc. — bluish red; on dilution — red, then orange solution and ppt.

Aqueous solution + HCl — orange brown ppt;

+ NaOH — dark brown

13105 C.I. Acid Yellow 26 (Yellow)

The main component is probably



6-Chlorometanilic acid → Diphenylamine;

treat with sodium nitrite to form the *N*-nitroso derivative, nitrate, then treat with sodium bisulfite to denitrosate

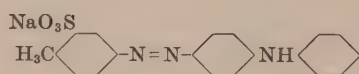
Discoverer — I.G. 1928

Silk Yellow GF (IG)

BIOS 1548, 42

BIOS 961, 63

FIAT 764 — Seidengelb GF

13110 Acid Dye

5-Amino-*o*-toluenesulfonic acid → Diphenylamine

Discoverer — Z. Roussin 1878

Fast Yellow N (St. D)

Dyes wool from an acid dyebath

BP 4491/78

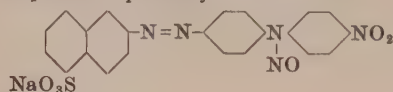
Soluble in water (yellow)

H₂SO₄ conc. — bluish green; on dilution — steel blue ppt.

Aqueous solution + HCl — steel blue ppt.

13115 C.I. Acid Yellow 33 (Reddish yellow)

The main component is probably



6-Amino-1-naphthalenesulfonic acid → Diphenylamine;

then treat with sodium nitrite to form the *N*-nitroso derivative and nitrate

(A technical mixture of 6(and 7)-amino-1-naphthalenesulfonic acids may be used in place of 6-amino-1-naphthalenesulfonic acid)

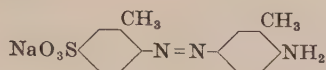
Discoverer — I.G. 1928

Silk Yellow R (IG)

BIOS 961, 64

BIOS 1548, 42

FIAT 764 — Seidengelb R

13130 Acid Dye

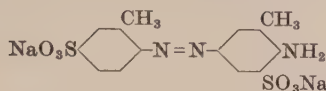
- (a) Monosulfonate 4-(*o*-tolylazo)-*o*-toluidine, or
 (b) 4-Amino-*m*-toluenesulfonic acid → *o*-Toluidinomethanesulfonic acid;
 then heat in dilute caustic alkaline medium to remove the methanesulfonic acid group

Discoverer — Badische Co. (prior to 1878); F. Grässler 1878

New Yellow RMF (B)

Used as an intermediate in the manufacture of disazo and trisazo dyes (see 4-(4-amino-*m*-tolylazo)-*m*-toluenesulfonic acid)

Grässler, *BP* 43/79; *USP* 253598; *FP* 128113; *GP* 4186, 7094, 9384, (*Fr.* 1, 439-441)
 Agfa, *BP* 11343/99; *GP* 131860 (*Fr.* 6, 872)

13135 C.I. Acid Yellow 69 (Reddish yellow)

Disulfonate 4-(*o*-tolylazo)-*o*-toluidine

Discoverer — F. Grässler 1878

Fast Yellow (B)

BP 43/79; *USP* 253598; *FP* 128113; *GP* 4186, 7094, 9384 (*Fr.* 1, 439-441)

FIAT 764 — Echtgelb

Griess, *Ber.* 15 (1882), 2187

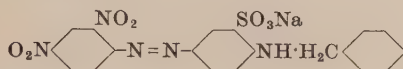
Soluble in water (greenish yellow)

Slightly soluble in ethanol

H_2SO_4 conc. — golden yellow; on dilution — reddish orange

Aqueous solution + HCl conc. — reddish orange;

+ $NaOH$ conc. — greenish yellow

13140 Acid Dye

2,4-Dinitroaniline → *o*-Benzylaminobenzenesulfonic acid

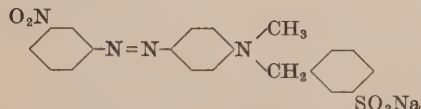
Discoverer — I.G. 1928

Cellit Fast Red B (IG)

Dyed on cellulose acetate at 60-70°C. in the presence of Glauber's salt, ammonium chloride or acetic acid

Fastness Properties (on acetate) (C): Acid 3-4, Alkali 5, Light 4, Perspiration 3, Washing 3, Water 2

FIAT 764 — Cellitechtrout B

13145 Acid Dye

m-Nitroaniline → *α*-*N*-Methylanilino-*m*-toluenesulfonic acid

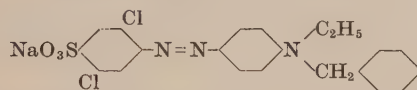
Discoverer — I.G. 1928

Cellit Fast Yellow R (IG)

Dyed on cellulose acetate at 60-70°C. in the presence of Glauber's salt, ammonium chloride or acetic acid

Fastness Properties (on acetate) (C): Acid (organic) 1, Alkali 5, Light 4, Perspiration 3, Washing 3, Water 2-3

FIAT 764 — Cellitechthgelb R

13150 C.I. Acid Orange 50 (Bright reddish orange)

2,5-Dichlorosulfanilic acid → *N*-Ethyl-*N*-phenylbenzylamine

Discoverer — I.G. 1935

FIAT 764 — Walkorange G

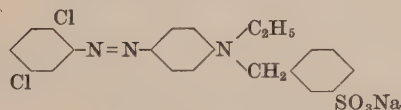
Soluble in water (orange), ethanol and Cellosolve

Insoluble in other organic solvents

H_2SO_4 conc. — yellowish brown; on dilution — reddish orange

Aqueous solution + H_2SO_4 10% — pinkish orange;

+ $NaOH$ 10% — dull reddish orange

13155 Acid Dye

2,5-Dichloroaniline → *α*-*N*-Ethylanilino-*m*-toluenesulfonic acid

Discoverer — H. Polikier 1911

Milling Yellow R (IG)

Dyes wool from a weakly acid or neutral dyebath, levelling moderate

Fastness Properties (C): Light 2, Washing 4-5, Perspiration 4, Alkaline milling 3

Agfa, *BP* 13304/11; *USP* 1003293; *FP* 430146; *GP* 251843 (*Fr.* 11, 379)

FIAT 764 — Walkgelb R

For *α*-*N*-ethylanilino-*m*-toluenesulfonic acid —

Agfa, *BP* 7550/89; *FP* 198415; *GP* 50782 (*Fr.* 2, 47)

Geigy, *BP* 21284/90; *GP* 59811 (*Fr.* 3, 115)

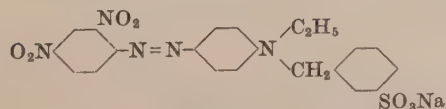
Gnehm & Schönholzer, *J. prakt. Chem.* 76 (1907), 489

Blangey, Fierz-David & Stamm, *Helv. Chim. Acta*, 25 (1942), 1162

Soluble in water and ethanol (golden yellow)

H_2SO_4 conc. — golden yellow; on dilution — pink

Aqueous solution + HCl conc. — red;
 + $NaOH$ conc. — lemon yellow

13160 Acid Dye

2,4-Dinitroaniline → *α*-*N*-Ethylanilino-*m*-toluenesulfonic acid

Discoverers — G. Monmollin and G. Bonhôte 1924

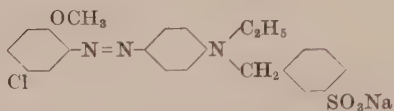
Ciba, *USP* 1534506 **Cellit Fast Rubine B (IG)**

Dyed on cellulose acetate at 60-70°C. in the presence of Glauber's salt, ammonium chloride or acetic acid

Fastness Properties (on acetate) (C): Acid 3-4, Alkali 4, Light 3-4, Perspiration 2, Washing 3, Water 2-3

FIAT 764 — Cellitechtrubin B

13165 Acid Dye



5-Chloro-*o*-anisidine \rightarrow α -*N*-Ethylanilino-*m*-toluenesulfonic acid

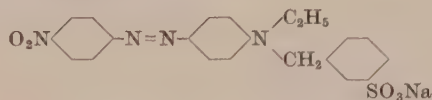
Discoverer — Bayer Co. 1913

Milling Yellow RG (By)

Dyes wool from a weakly acid dyebath
Bayer Co., GP 282957 (*Fr.* 12, 314)

Soluble in water (golden orange) and ethanol (golden yellow)
 H_2SO_4 conc. — scarlet to red; on dilution — reddish violet
Aqueous solution + HCl conc. — reddish violet;
+ NaOH conc. — golden orange, ppt.

13170 Acid Dye



p-Nitroaniline \rightarrow α -*N*-Ethylanilino-*m*-toluenesulfonic acid

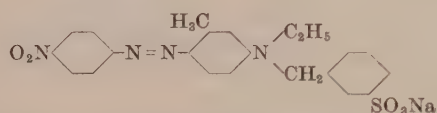
Discoverer — Schönbrodt 1893

Azo Cardinal G (A)

Dyes wool from an acid dyebath, fast to light acids and alkalis, moderate fastness to washing
GP ap. 3551

Soluble in water and ethanol (reddish yellow)
 H_2SO_4 conc. — yellow; on dilution — red solution, then red ppt.
Aqueous solution + HCl — red metallic glistening ppt;
+ NaOH conc. — brick red ppt.

13175 Acid Dye



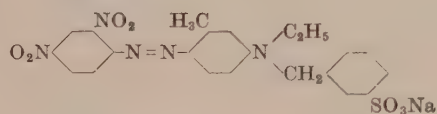
p-Nitroaniline \rightarrow α -(*N*-Ethyl-*m*-toluidino)-*m*-toluenesulfonic acid

Discoverer — I.G. 1928

Cellit Fast Red BB (IG)

Dyed on cellulose acetate at 60–70°C. in the presence of Glauber's salt, ammonium chloride or acetic acid
Fastness Properties (on acetate) (C): Acid 2, Alkali 5, Light 4–5, Perspiration 3, Washing 3–4, Water 2
FIAT 764 — Cellitechtrout BB
I.G., PB 82232, *fr.* 676 — Cellitechtrout BB

13180★ Acid Dye



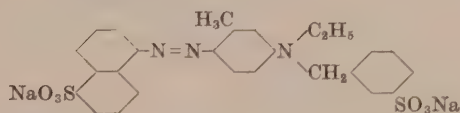
2,4-Dinitroaniline \rightarrow α -(*N*-Ethyl-*m*-toluidino)-*m*-toluenesulfonic acid

Discoverer — I.G. 1928

Cellit Fast Violet 4R (IG)

Dyed on cellulose acetate at 60–70°C. in the presence of Glauber's salt, ammonium chloride or acetic acid
Fastness Properties (on acetate) (C): Acid (organic) 3–4, Alkali 5, Light 4, Perspiration 2–3, Washing 3, Water 2–3
FIAT 764 — Cellitechtriviolet 4R

13185 Acid Dye



5-Amino-1-naphthalenesulfonic acid
 \rightarrow α -(*N*-Ethyl-*m*-toluidino)-*m*-toluenesulfonic acid

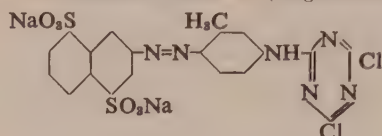
Discoverer — L. Hesse 1911

Sulfon Orange 5G (By)

Dyes wool from a weakly acid dyebath, levelling moderate
Fastness Properties (C): Light 3–4, Washing 3, Perspiration 4, Alkaline milling 3
Bayer Co., BP 14555/12; USP 1054348; FP 446759; GP 253933 (*Fr.* 11, 382)

Soluble in water (orange) and ethanol (golden yellow)
 H_2SO_4 conc. — pink; on dilution — reddish violet
Aqueous solution + HCl conc. — violet;
+ NaOH conc. — orange

13190 C.I. Reactive Yellow 4 (Bright reddish yellow)

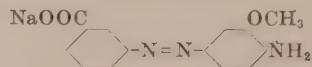


3-Amino-1,5-naphthalenedisulfonic acid \rightarrow *m*-Toluidine;
then react with cyanuric chloride (1 mol.)

Călin, Săndulescu, Rosenberg and Tibrea, *Coloristica Buletin Informativ*, 4 (No. 11, 1968) 179–200

Lukos & Ornaf, *Barwniki Reaktywne*, Warsaw, Wydawnictwo Przemysłu Lekkiego i Spozywczego, 1966

13200 C.I. Acid Yellow 66 (Yellow)

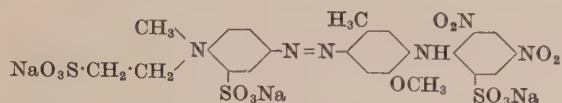


m-Aminobenzoic acid \rightarrow *o*-Anisidinomethanesulfonic acid;
then heat in dilute caustic alkaline medium to remove the methanesulfonic acid group

Cellit Fast Yellow GGN (IG)

FIAT 764 — Cellitechgelb GGN

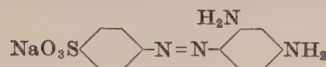
Soluble in water, ethanol and acetone
Slightly soluble in benzene
 H_2SO_4 conc. — yellowish orange; on dilution — orange
Aqueous solution + NaOH dil. — yellow

13210 Acid Dye

N-(4-Amino-2-sulfophenyl)-*N*-methyltaurine → Cresidine;
then condense with 2-chloro-3,5-dinitrobenzenesulfonic acid

FIAT 764 — Igenalbraun 74458D

This dye is only known as a component of mixture dyes for leather, e.g. Igenal Brown IRG

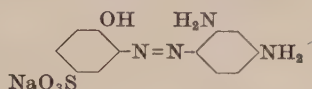
13220 C.I. Direct Brown 191 (Reddish brown)

Sulfanilic acid → *m*-Phenylenediamine

Aqueous solution + HCl conc. — orange brown ppt;
+ NaOH conc. — unchanged

The following references relate only to application to textiles —
Bayer Co., BP 12140/1910; USP 1006097; FP 425831; GP ap.
F29415 (Fr. 10, 919)

Soluble in water (yellowish orange)
Soluble in ethanol (yellow)
H₂SO₄ conc. — orange; on dilution — orange

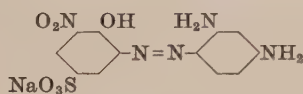
13225 C.I. Mordant Brown 13 (Dull reddish brown)

2-Amino-1-phenol-4-sulfonic acid → *m*-Phenylenediamine

Aqueous solution + HCl conc. — orange;
+ NaOH conc. — golden orange

Discoverers — E. Erdmann and O. Borgmann 1893
Erdmann & Borgmann, GP 78409 (Fr. 4, 785)
Badische Co., USP 628814; FP 284741
FIAT 764 — Saeurealizarinbraun B

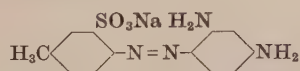
Soluble in water (reddish yellow)
Slightly soluble in ethanol, acetone and Cellosolve
H₂SO₄ conc. — brownish orange; on dilution — orange
HNO₃ conc. — red, becomes yellowish brown

13230 C.I. Mordant Brown 30 (Dull reddish brown)

2-Amino-6-nitro-1-phenol-4-sulfonic acid → *m*-Phenylenediamine

M.L.B., BP 198/99; FP 284723; GP 127419 (Fr. 6, 907)
FIAT 764 — Saeurealizarinbraun BB

Soluble in water (wine red to bordeaux) and ethanol (olive yellow brown)
H₂SO₄ conc. — orange to reddish brown; on dilution — golden yellow (yellowish brown ppt).
Aqueous solution + HCl conc. — golden orange;
+ NaOH conc. — reddish orange brown

13235 Direct Dye

6-Amino-*m*-toluenesulfonic acid → *m*-Phenylenediamine

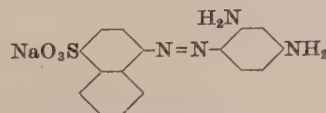
Aqueous solution + HCl conc. — yellowish brown solution and ppt;
+ NaOH conc. — yellowish orange

Discoverers — M. Kahn and A. Ossenbeck 1910

Para Chrysoin RRK (By)

Is coupled on the fibre with diazotised *p*-nitroaniline
Bayer Co., BP 12140/10; USP 1006097; FP 425831; GP ap.
F29415 (Fr. 10, 919)

Slightly soluble in water (yellowish olive)
Soluble in ethanol (orange brown)
H₂SO₄ conc. — reddish yellow; on dilution — orange

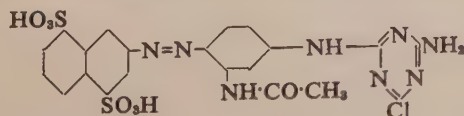
13240 Direct Dye

Naphthionic acid → *m*-Phenylenediamine

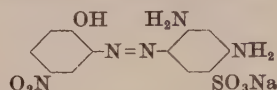
Parazol Brown RK (By)

Is coupled on the fibre with diazotised *p*-nitroaniline
Bayer Co., USP 1006097

Moderately soluble in water and ethanol (orange brown)
H₂SO₄ conc. — dark blue; on dilution — brownish orange
Aqueous solution + HCl conc. — yellowish brown solution and ppt; + NaOH conc. — unchanged

13245 C.I. Reactive Yellow 3 (Bright reddish yellow)

Panchartek, Allan and Mužik, Coll. Czech. Chem. Commun.,
25 (1960) 2783-2799
Austrian Pat. 202,243

13250 C.I. Mordant Brown 33 (Yellowish brown)

2-Amino-4-nitrophenol → 2,4-Diaminobenzenesulfonic acid

HNO₃ conc. — red solution, turning yellowish brown
 Aqueous solution + HCl conc. — brownish orange;
 + NaOH conc. — orange

Discoverer — Bayer Co. 1905

Dyes of similar constitution —

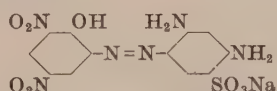
M.L.B., *GP ap.* F11055 (*Fr.* 5, 525); *GP* 124791 (*Fr.* 6, 906)
FIAT 764 — Saeureanthracenbraun RH ex.

Soluble in water and ethanol (yellow to yellowish brown) and Cellosolve

Slightly soluble in acetone

Insoluble in other organic solvents

H₂SO₄ conc. — red to reddish brown; on dilution — orange (ppt.)

13255 Mordant Dye

Picramic acid → 2,4-Diaminobenzenesulfonic acid

Compare C.I.13265

Discoverer — K. Schirmacher 1898

Acid Alizarine Brown RP (MLB)

M.L.B., *BP* 16893/98; *USP* 647236; *FP* 280329; *GP ap.* F11055 (*Fr.* 5, 525), *GP* 124791 (*Fr.* 6, 906)

Soluble in water (orange brown)

Slightly soluble in ethanol (reddish brown)

H₂SO₄ conc. — magenta red; on dilution — golden yellow

Aqueous solution + HCl conc. — yellowish brown;

+ NaOH conc. — orange brown

13260 C.I. Acid Brown 265 (Brown)

A chromium complex derived from C.I.13255 and containing 3 mol. monoazo compound to 2 atoms of chromium

Heat C.I.13255 with aqueous chromium formate under pressure

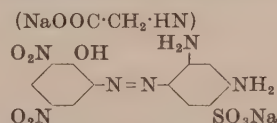
Discoverers — H. Krzikalla and F. P. Blümmel 1927

I.G., *BP* 306732; *FP* 664142; *Sw.P* 141315; *GP* 520738 (*Fr.* 17, 1035)

BIOS 961, 74

BIOS 1548, 37

FIAT 764 — Erganildunkelbraun C

13265 C.I. Mordant Brown 49 (Reddish brown)

Picramic acid → mixture of 2,4-diaminobenzenesulfonic acid and *N*-(3-amino-4-sulphophenyl)glycine

Discoverers — P. Ott, A. Israel and R. Kothe 1899

Bayer Co., *BP* 13213/99; *USP* 658506; *FP* 290205; *GP* 113941 (*Fr.* 6, 86)

FIAT 764 — Saeureanthracenbraun R, R27104 "F"

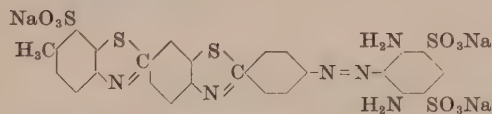
Soluble in water (orange brown)

Slightly soluble in ethanol

H₂SO₄ conc. — magenta red; on dilution — orange to golden yellow

Aqueous solution + HCl conc. — yellowish brown;

+ NaOH conc. — orange brown

13270 Direct Dye

Primuline (C.I.49000) → 4,6-Diamino-*m*-benzenedisulfonic acid

H₂SO₄ conc. — olive brown and magenta; on dilution — brownish orange

Aqueous solution + HCl conc. — orange brown ppt;
 + NaOH conc. — yellowish brown ppt.

Discoverer — C. L. Müller 1893

Cotton Orange G (B)

Fastness Properties (C): Acid (organic) 3, Alkali 4, Light 1, 2, 3, Washing 1-2, Water 1-2

Badische Co., *BP* 14678/93; *USP* 524262; *FP* 231694; *GP* 73369 (*Fr.* 3, 745)

FIAT 764 — Baumwollorange G

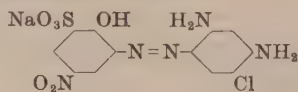
Bogert & Snell, *Col. Tr. J.* 14 (1924), 109

Soluble in water (golden orange)

Very slightly soluble in ethanol

13280 C.I. Acid Brown 145 (Brown)*

A chromium complex derived from



6-Amino-4-nitro-1-phenol-2-sulfonic acid
 → 4-Chloro-*m*-phenylenediamine;

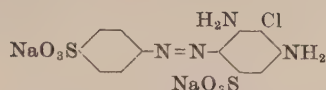
then heat under pressure with chromium formate or oxalate

* On leather

Discoverers — H. Krzikalla and F. P. Blümmel 1927

I.G., *BP* 306732; *USP* 1923216; *FP* 664142; *GP* 551883 (*Fr.* 19, 1723)

FIAT 764 — Erganilmittelbraun C

13290 Acid Dye

Sulfanilic acid \rightarrow 3,5-Diamino-4-chlorobenzenesulfonic acid

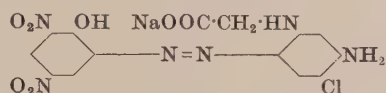
Aqueous solution + HCl — darker;
+ NaOH — yellow

Discoverer — F. C. Günther 1904

New Fast Yellow R (B)

Dyes wool from an acid dyebath
Badische Co., BP 5861/05; USP 798098; FP 352539; GP 165502
(Fr. 8, 559)

Soluble in water (yellowish brown)
 H_2SO_4 conc. — magenta; on dilution — bluish red becoming yellowish brown

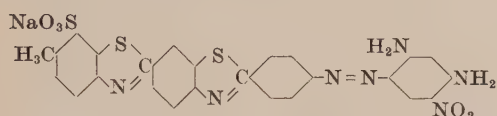
13295 C.I. Mordant Brown 11 (Dull reddish brown)

Picramic acid \rightarrow N-(3-Amino-4-chlorophenyl)glycine

Discoverer — I.G. 1932

FIAT 764 — Metachrombraun BR

Soluble in water (orange brown)
Slightly soluble in ethanol (brownish red) and orange
 H_2SO_4 conc. — dull reddish orange; on dilution — dull orange
 H_2SO_4 10% — yellowish orange

13300 Direct Dye

Primuline (C.I.49000) \rightarrow 4-Nitro-m-phenylenediamine

H_2SO_4 conc. — brownish yellow; on dilution — reddish brown ppt.

Aqueous solution + HCl — reddish brown ppt;
+ NaOH — unaltered or yellowish brown ppt.

Discoverers — A. Bernthsen and P. Julius 1893

Pyramine Yellow RX (B)

Fastness Properties (C): Acid (organic) 2, Alkali 3,
Light 2, Washing 2-3, Water 2

Dischargeability: neutral and alkaline, poor

Badische Co., BP 8564/94; USP 545333; FP 238340; GP 80973
(Fr. 4, 855)

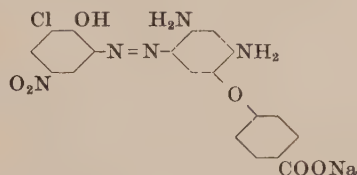
Agfa, FP 314468; GP 130438 (Fr. 6, 93)

FIAT 764 — Pyramingelb RX

Barbaglia, Ber. 7 (1874), 1257 (4-nitro-m-phenylenediamine)

Deichler, Chem. Ind. 27 (1904), 41

Soluble in hot water (yellowish brown)
Slightly soluble in ethanol (yellow)

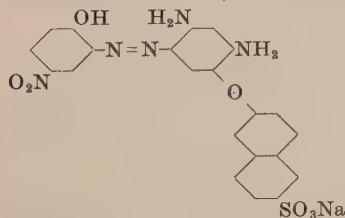
13305 C.I. Mordant Brown 25 (Yellowish brown)

2-Amino-6-chloro-4-nitrophenol
 \rightarrow p-(2,4-Diaminophenoxy)benzoic acid

Discoverers — J. Jansen and W. Neelmeier 1909

Bayer Co., BP 20334/10; USP 981276; FP 418733; GP 229966
(Fr. 10, 856)

Soluble in water (golden yellow)
Very slightly soluble in ethanol (pale orange brown)
 H_2SO_4 conc. — cherry red; on dilution — pale yellow
Aqueous solution + HCl conc. — pale olive yellow;
+ NaOH conc. — orange brown

13310 C.I. Mordant Brown 14 (Reddish brown)

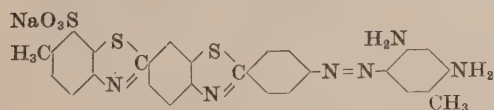
2-Amino-4-nitrophenol
 \rightarrow 6-(2,4-Diaminophenoxy)-2-naphthalenesulfonic acid

Discoverer — G. Kalischer 1906

Cassella Co., BP 22021/06; USP 879552; FP 379999; GP 187150
(Fr. 9, 338)

FIAT 764 — Anthracenchrombraun SWN

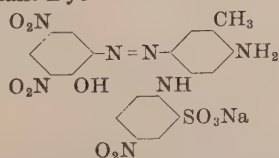
Soluble in water (orange brown) and ethanol (golden yellow)
 H_2SO_4 conc. — orange brown; on dilution — golden orange
Aqueous solution + HCl conc. — orange brown, ppt;
+ NaOH conc. — reddish orange brown

13320 C.I. Direct Brown 53 (Reddish brown)

Primuline (C.I.49000) \rightarrow Toluene-2,4-diamine

Discoverer — A. G. Green 1887

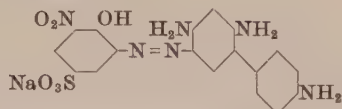
Soluble in water and ethanol (orange brown)
 H_2SO_4 conc. — orange red + wine red; on dilution — yellowish brown
Aqueous solution + HCl conc. — brown ppt;
+ NaOH conc. — orange brown ppt.

13330 Mordant Dye

Picramic acid \rightarrow 2-(3-Amino-p-toluidino)-5-nitrobenzenesulfonic acid

Acid Anthracene Brown G (By)

Weiler-ter-Meer, GP ap. C23677 (Fr. 12, 328)

13340 Mordant Dye

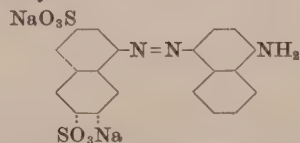
2-Amino-6-nitro-1-phenol-4-sulfonic acid \rightarrow 2,4,4'-Biphenyltriamine

Discoverers — M. Kahn and A. Ossenbeck 1911

Acid Anthracene Brown P (By)

Bayer Co., *BP* 11085/11; *USP* 1027132; *FP* 438211; *GP* 247647 (*Fr.* 11, 404)

Soluble in water (bordeaux to corinth)
Slightly soluble in ethanol (orange brown)
 H_2SO_4 conc. — cherry red; on dilution — golden yellow
Aqueous solution + HCl conc. — yellowish brown;
+ $NaOH$ conc. — reddish orange brown

13350 Acid Dye

4-Amino-2,6 (and 2,7)-naphthalenedisulfonic acids \rightarrow 1-Naphthylamine

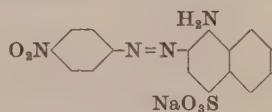
Discoverers — Dahl Co. 1886; (marketed by Bayer Co. 1894)

Naphthylamine Red (By)

Dahl Co., *GP* 41957, 42440 (*Fr.* 1, 407, 410)

FIAT 764 — Naphtylaminrot

Soluble in water (orange brown)
Slightly soluble in ethanol (weak brown)
 H_2SO_4 conc. — violet; on dilution — reddish violet
Aqueous solution + HCl conc. — reddish violet;
+ $NaOH$ conc. — orange brown

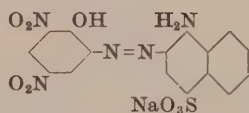
13355 C.I. Acid Red 74

p-Nitroaniline \rightarrow Naphthionic acid

Discoverers — Z. Roussin and A. F. Poirrier 1878

BP 4490/78; *FP* 127221; *GP* 6715 (*Fr.* 1, 531)

Soluble in water (reddish brown)
 H_2SO_4 conc. — magenta red; on dilution — brownish red ppt.
Aqueous solution + HCl — brownish red ppt;
+ $NaOH$ — brownish red ppt.

13360 Mordant Dye

Picramic acid \rightarrow Naphthionic acid

Discoverer — Dahl Co. 1902

Anthracyl Chrome Green D739 (WDC)

Dyes both metachrome and afterchrome but is very sensitive to copper and iron in the dyebath. The olive green dyeings produced by the afterchrome method have good fastness to light and milling.

Dahl Co., *GP* 142153 (*Fr.* 7, 387)

Soluble in water (brownish red)
 H_2SO_4 conc. — red; on dilution — chocolate brown crystalline ppt.
Aqueous solution + HCl — bordeaux red, ppt;
+ $NaOH$ — unaltered, red ppt. with excess

13361 C.I. Acid Green 35 (Dull bluish green)

A chromium complex derived from C.I.13360

Heat C.I.13360 with chromium formate in aqueous solution under pressure

Discoverer — F. Straub 1925

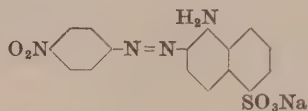
Ciba, *BP* 247556; *USP* 1626167; *FP* 609517; *Sw.P* 115111; *GP* 483460 (*Fr.* 16, 956)

BIOS 961, 72

BIOS 1548, 34

FIAT 764 — Palatinecht dunkelgruen BN

Soluble in water (dark green)
Aqueous solution + $NaOH$ — unchanged

13365 Acid Dye

p-Nitroaniline \rightarrow 5-Amino-1-naphthalenesulfonic acid

Discoverers — A. F. Poirrier and Z. Roussin 1887

Archil Substitute 3VN (St. D)

Dyes wool from an acid dyebath, moderate fastness to light and stoving

S.A. St. Denis, *BP* 12692/87; *USP* 380928; *FP* 185908; *GP* 45787 (*Fr.* 2, 310)

Gattermann & Schultze, *Ber.* 30 (1897), 50

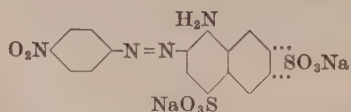
Gattermann & Liebermann, *Ann.* 393 (1912), 198

Soluble in water (red)

Slightly soluble in ethanol

H_2SO_4 conc. — red

Aqueous solution + HCl — bluish colour or ppt;
+ $NaOH$ — brownish

13370 Acid Dye

p-Nitroaniline \rightarrow 4-Amino-1,6 (and 1,7)-naphthalenedisulfonic acids

Discoverer — Adelbert Mylius 1887

Apollo Red B, G (Gy)

Dyes wool from an acid dyebath, moderate fastness to stoving

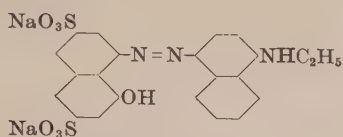
Geigy, *BP* 9468/87; *USP* 376392; *FP* 184638

Soluble in water (brownish red)

H_2SO_4 conc. — magenta red; on dilution — unaltered

Aqueous solution + HCl — magenta red;

+ $NaOH$ — brown ppt.

13375 Acid Dye

H acid → *N*-Ethyl-1-naphthylamine

Lanacyl Violet BF (C)

Dyes wool from an acid dyebath, fast to light and washing and moderate fastness to milling, acids and alkalis

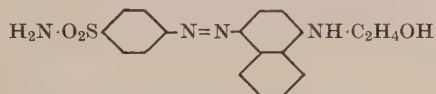
Cassella Co., *BP* 12556/96; *FP* 257136; *GP* 94288 (*Fr.* 4, 715)
FIAT 764 — Lanacylviolet BF

Soluble in water

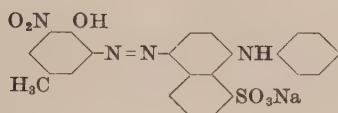
Slightly soluble in ethanol (reddish violet)

H₂SO₄ conc. — greenish blue; on dilution — reddish violet

Aqueous solution + HCl conc. — reddish violet;
+ NaOH conc. — brownish orange

13379 C.I. Disperse Red 6 (Yellowish Red)

Sulfanilamide → 2(1-Naphthylamino)ethanol

Serinyll Brilliant Scarlet R D (YDC)**13380 Mordant Dye**

2-Amino-6-nitro-*p*-cresol → *N*-Phenyl Peri acid

Discoverer — L. Böniger 1905

Sandoz, *BP* 22738/05; *USP* 841371; *FP* 359222; *GP* 175625 (*Fr.* 8, 624)

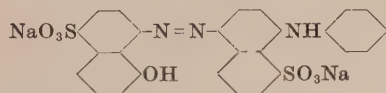
Bayer Co., *BP* 7337/92; *FP* 221233; *GP* 70349, 71158, (*Fr.* 3, 513, 515) (*N*-Phenyl Peri acid)

Note — Omega Chrome Black P (S) which appears under *C.I.* (1st Ed.) 96 has the constitution of C.I.15710 and there is no evidence available that a dye of the constitution of 13380 was ever marketed

Soluble in water (brownish red) and ethanol (bluish red)

H₂SO₄ conc. — blue; on dilution — dark violet ppt, then browner ppt.

Aqueous solution + HCl — brown ppt;
+ NaOH — bluish red

13385 C.I. Acid Blue 135 (Reddish navy)

S acid → *N*-Phenyl Peri acid

Discoverers — M.L.B. 1914; (marketed by Bayer Co. 1914)

Tolyl Blue NB (By)

M.L.B., *FP* 265446; *GP ap.* F38821 (*Fr.* 12, 318)

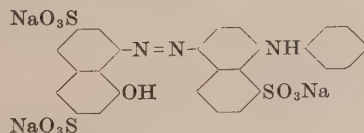
FIAT 764 — Tolyblau NB

Soluble in water (violet blue)

Moderately soluble in ethanol (violet blue)

H₂SO₄ conc. — greenish olive (+ blue and yellow); on dilution — blue

Aqueous solution + HCl conc. — dull blue, ppt;
+ NaOH conc. — corinth ppt.

13390 C.I. Acid Blue 92 (Reddish blue)

H acid → *N*-Phenyl Peri acid

Discoverer — M. Ulrich 1897

Bayer Co., *BP* 8188/97; *USP* 611664; *FP* 265446; *GP* 75571 (*Fr.* 4, 717)

Leonhardt Co., *BP* 24830/98; *GP* 108546 (*Fr.* 5, 497)

FIAT 764 — Sulfonsaeureblau R

King, *JCS* (1927), 2643

Soluble in water (violet) and Cellosolve

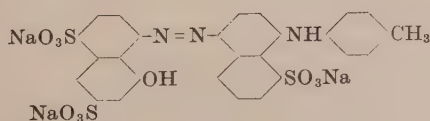
Slightly soluble in ethanol (reddish blue)

Insoluble in other organic solvents

H₂SO₄ conc. — dull dark green; on dilution — blue

HNO₃ conc. — maroon, becoming orange

Aqueous solution + HCl conc. — blue;
+ NaOH conc. — reddish orange brown

13400 Acid Dye

K acid → *N*-*p*-Tolyl Peri acid

Discoverer — M. Ulrich 1897

Sulfon Acid Blue G (By)

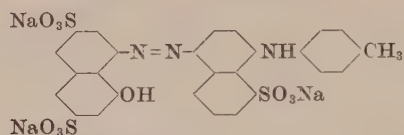
Bayer Co., *BP* 8188/97; *USP* 611644; *FP* 265446; *GP* 75571 (*Fr.* 4, 717)

Leonhardt Co., *BP* 24830/98; *GP* 108546 (*Fr.* 5, 497)

Soluble in water (violet) and ethanol (blue)

H₂SO₄ conc. — blue black; on dilution — blue

Aqueous solution + HCl conc. — blue;
+ NaOH conc. — corinth

13405 C.I. Acid Blue 89 (Reddish blue)

H acid → *N-p*-Tolyl Peri acid

Aqueous solution + HCl conc. — blue ppt;
+ NaOH conc. — reddish orange brown

Discoverer — M. Ulrich 1897

Bayer Co., BP 8188/97; USP 611664; FP 265446; GP 75571
(Fr. 4, 717)

Leonhardt Co., BP 24830/98; GP 108546 (Fr. 5, 497)

BIOS 1548, 68

FIAT 764 — Sulfonsaeureblau B

Soluble in water and ethanol (reddish blue)

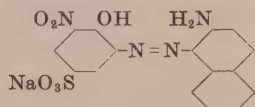
Insoluble in most other organic solvents

H₂SO₄ conc. — dark reddish blue to blue black; on dilution — blue

HNO₃ conc. — dull yellow solution

13420 C.I. Acid Green 45 (Green)

A chromium complex derived from



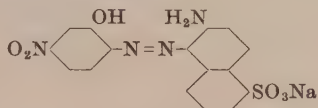
2-Amino-6-nitro-1-phenol-4-sulfonic acid → 2-Naphthylamine;
then heat with chromium formate in aqueous solution under pressure

BIOS 961, 72

FIAT 764 — Palatinechtgruen BGN

13425 C.I. Acid Green 12 (Bluish green)

A chromium complex derived from



2-Amino-5-nitrophenol → 6-Amino-1-naphthalenesulfonic acid;
then treat with chromium formate

(In some brands either Broenner's acid or 7-amino-2-naphthalene-sulfonic acid may take the place of 6-amino-1-naphthalenesulfonic acid)

Discoverer — A. Grob 1918

Ciba, BP 129782; USP 1394823; Sw.P 86679

BIOS 961, 72

FIAT 764 — Palatinechtgruen BLN kz.

Soluble in water and ethanol (green)

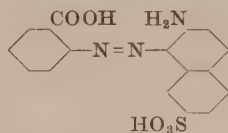
Slightly soluble in Cellosolve

H₂SO₄ conc. — bluish red; on dilution — blue to green solution

Aqueous solution + H₂SO₄ 10% — no change

13430 Pigment

The calcium salt of a chromium complex compound derived from



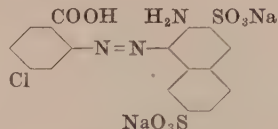
Anthranilic acid → 7-Amino-2-naphthalenesulfonic acid;
then heat with chromium sulfate in weakly acid solution to form the chromium complex and finally convert to the calcium salt

Helio Fast Violet RRL (By)

FIAT 764 — Helioechtviolett RRL

13435 Pigment

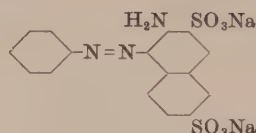
A chromium complex derived from



4-Chloroanthranilic acid → 3-Amino-2,6-naphthalenedisulfonic acid;
then convert to chromium complex

Helio Fast Violet BL (By)

FDX885 — Helioechtviolett BL

13440 Acid Dye

Aniline → 3-Amino-2,7-naphthalenedisulfonic acid

Discoverer — Bayer Co.

Yellow 27175 Specially Pure (IG)

Used as a food dye

FIAT 764 — Gelb 27175

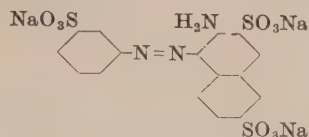
Soluble in water (golden orange)

Slightly soluble in ethanol (golden yellow)

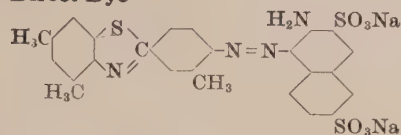
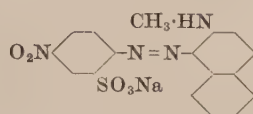
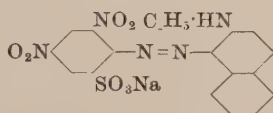
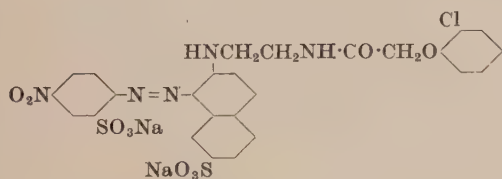
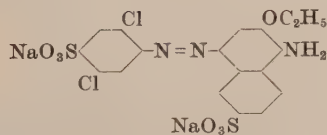
H₂SO₄ conc. — red; on dilution — through violet to golden yellow

Aqueous solution + HCl conc. — yellowish brown;

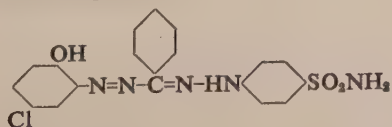
+ NaOH conc. — golden yellow

13445 C.I. Food Yellow 7*Discoverer* — Bayer Co.

Metanilic acid → 3-Amino-2,7-naphthalenedisulfonic acid

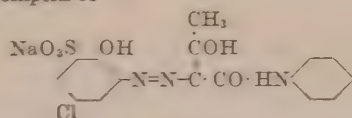
Soluble in water
Moderately soluble in ethanol**13450 Direct Dye**2-(4-Amino-*m*-tolyl)-4,6-dimethylbenzothiazole
→ 3-Amino-2,7-naphthalenedisulfonic acid*Discoverer* — G. Schultz**Salmon Red (A)**Paul, *Z. angew. Chem.* **9** (1896), 680Soluble in water (orange red)
H₂SO₄ conc. — violet; on dilution — garnet red ppt.
Aqueous solution + HCl — garnet red ppt;
+ NaOH — soluble red ppt.**13455 C.I. Acid Violet 27 (Dull violet)**2-Amino-5-nitrobenzenesulfonic acid → *N*-Methyl-2-naphthylamine*Discoverers* — O. Günther and L. Hesse 1908**Victoria Fast Violet B extra (By)**Bayer Co., *USP* 921105; *FP* 396949; *GP* 212973 (*Fr.* **9**, 328)
BIOS 1548, 62*FIAT* 764 — Viktoriaeichtviolett B ex.Soluble in water (violet), ethanol and acetone
Insoluble in benzene
H₂SO₄ conc. — brownish orange; on dilution — dull pink
Aqueous solution + HCl conc. — brown, ppt;
+ NaOH conc. — violet ppt.**13460 Acid Dye**2-Amino-3,5-dinitrobenzenesulfonic acid
→ *N*-Ethyl-2-naphthylamine*Discoverer* — I.G. 1929**Cellit Blue R (IG)**Used for dyeing cellulose acetate
*FDX*885 — Cellitblau R**13470 Acid Dye**2-Amino-5-nitrobenzenesulfonic acid
→ 7-(2-Aminoethylamino)-2-naphthalenesulfonic acid;
then condense with (*o*-chlorophenoxy)acetyl chloride*Discoverers* — W. Hentrich and R. Knoche 1927**Supramine Violet R (IG)**Dyes wool from a sulfuric acid dyebath, levelling fairly good
Fastness Properties (C): Light 6, Washing 2,
Perspiration 4, Alkaline milling 2-3
I.G., *BP* 313110; *USP* 1871991; *FP* 650778; *GP* 477912 (*Fr.* **16**, 1011)Moderately soluble in water (ruby)
Soluble in ethanol (violet)
H₂SO₄ conc. — reddish orange to brown; on dilution — violet
Aqueous solution + HCl conc. — reddish violet;
+ NaOH conc. — ruby**13480 Acid Dye**2,5-Dichlorosulfanilic acid
→ 5-Amino-6-ethoxy-2-naphthalenesulfonic acid*Discoverer* — O. Günther 1913**Paper Bordeaux GGU (By)**Bayer Co., *BP* 20714/13; *USP* 1150675; *FP* 471881; *GP* 273934
(*Fr.* **12**, 348)
FIAT 764 — Papierbordo GGUSoluble in water (bordeaux)
Moderately soluble in ethanol (magenta red)
H₂SO₄ conc. — violet; on dilution — magenta red to reddish violet
Aqueous solution + HCl conc. — reddish orange brown;
+ NaOH conc. — violet**13710 C.I. Acid Black 180 (Bluish grey)**

2:1 Cobalt complex of

4-Chloro-2-aminophenol
→ *p*-(Benzylidenehydrazino)-benzenesulfonamide
and then convert to the cobalt complex

13890 C.I. Acid Orange 97 (Dull yellowish orange)

A 2:1 cobalt complex of

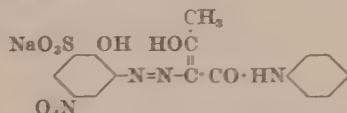


6-Amino-4-chloro-1-phenol-2-sulfonic acid → Acetoacetanilide;
then convert to the cobalt complex

Soluble in water (yellowish orange)
Moderately soluble in ethanol (orange)
H₂SO₄ conc. — orange; on dilution — greenish yellow
Aqueous solution + HCl — reddish yellow; + NaOH — orange

13900 C.I. Acid Yellow 99 (Reddish yellow)**13900:1 C.I. Solvent Yellow 19 (Yellow)**

A chromium complex, containing 1 atom of chromium to 1 mol. of monoazo dye, derived from



6-Amino-4-nitro-1-phenol-2-sulfonic acid → Acetoacetanilide;
then heat with an aqueous solution of chromium fluoride

C.I. 13900:1 is the free acid; and a component of **C.I. Solvent Red 36, 79, and 109**

Discoverers — F. Straub, G. Montmollin, J. Spieler, C. v. Planta 1924

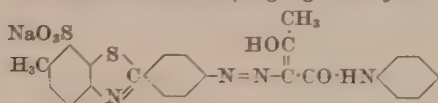
Ciba, *BP* 235862; *USP* 1656844; *FP* 598784; *GP* 448141 (*Fr.* 15, 498)
I.G., *FP* 634451; *GP* 517491 (*Fr.* 17, 1817)
BIOS 1548, 20
FIAT 764 — Palatinechtgelb GRN, Zaponechtgelb GR
FIAT 1313, 3, 133 — Component of Zapon Fast Fire Red B Extra

13901 Solvent DyeA cobalt complex derived from the same *o,o'*-dihydroxy azo dye as C.I.13900

H₂SO₄ conc. — brownish; on dilution — light brown solution

Zapon Fast Orange GE (IG)

FIAT 1313, 3, 135

13920 C.I. Acid Yellow 186 (Bright greenish yellow)**C.I. Direct Yellow 8 (Bright greenish yellow)**

Dehydrothio-*p*-toluidinesulfonic acid → Acetoacetanilide

H₂SO₄ conc. — bright yellow; on dilution — yellow ppt.
HNO₃ conc. — bright yellow solution
HCl conc. — partial solution (orange)

BIOS 961, 21

FIAT 764 — Dianilgelb 5G

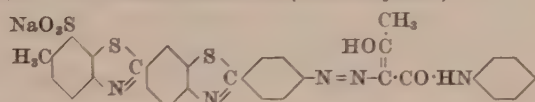
Structure of Dehydrothio-*p*-toluidinesulfonic acid:

Fierz-David, *Helv. Chim. Acta*, **27** (1943), 1

Schubert, *Ann.* **558** (1947), 10

Here and throughout the azo dye section dehydrothio-*p*-toluidinesulfonic acid is shown for simplicity as the 7-sulfonic acid although it is probably a mixture of 5- and 7-sulfonic acids in which the 7- greatly predominates

Soluble in water (yellow) and Cellosolve
Slightly soluble in ethanol
Very slightly soluble in other organic solvents

13925 C.I. Direct Yellow 22 (Greenish yellow)

Primuline (C.I.49000) → Acetoacetanilide

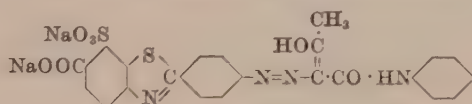
In C.I.647 (1st edition) the name *Dianil Yellow 3G* (MLB) was associated with the dye obtained by using ethyl acetoacetate in place of acetoacetanilide

Discoverer — F. Scholl 1897

M.L.B., *BP* 17328/97; *USP* 658593; *FP* 256647, 269001;
GP 98761 (*Fr.* 5, 609)

BIOS 961, 20

FIAT 764 — Dianilgelb 3G

13930 C.I. Direct Yellow 18 (Bright greenish yellow)

2-(*p*-Aminophenyl)-7-sulfo-6-benzothiazolecarboxylic acid
→ Acetoacetanilide

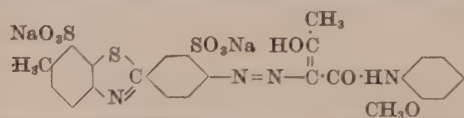
Discoverer — K. Desamari 1913

Bayer Co., *BP* 25029/13; *USP* 1125074; *FP* 471850; *GP* 274490
(*Fr.* 12, 336)

BIOS 1153, 355 (Preparation of 2-(*p*-aminophenyl)-7-sulfo-6-benzothiazolecarboxylic acid)

FIAT 764 — Benzoreingelb FF

Soluble in water and ethanol (lemon yellow)
H₂SO₄ conc. — golden yellow; on dilution — lemon yellow
Aqueous solution + HCl conc. — lemon yellow;
+ NaOH conc. — golden yellow

13950 C.I. Direct Yellow 27 (Bright greenish yellow)

Dehydrothio-*p*-toluidinedisulfonic acid → *o*-Acetoacetanilide

Discoverer — J. Huismann 1914

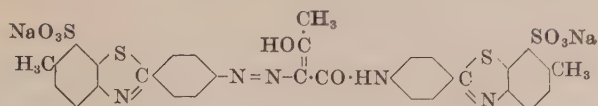
Bayer Co., *BP* 6644/14; *USP* 1159386; *FP* 743766; *GP* 293333
(*Fr.* 12, 337)

BIOS 1153, 358 (Preparation of dehydrothio-*p*-toluidinedisulfonic acid)

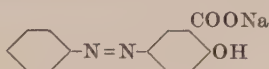
FIAT 764 — Siriuslichtgelb 5G

Soluble in water (lemon yellow) and Cellosolve
Very slightly soluble in ethanol
Bleeds slightly (orange) in benzene or carbon tetrachloride
Insoluble in other organic solvents
H₂SO₄ conc. — golden yellow; on dilution — paler
HNO₃ conc. — bright yellow solution

HCl conc. — partial solution (yellowish orange)
Aqueous solution + HCl conc. — golden yellow ppt;
+ NaOH conc. — golden orange ppt.

13970 Direct DyeDehydrothio-*p*-toluidinesulfonic acid→ 2-[*p*-(Acetylacetamido)phenyl]-
6-methyl-7-benzothiazolesulfonic acid*Discoverers* — A. Sieglitz and M. Reuter 1939**Dianil Yellow 3GW (IG)**Fastness Properties (C): Acid (organic) 3-4, Alkali 5,
Light 3, Washing 3-4, Water 4

Dischargeability: neutral, poor; alkaline, fair

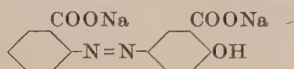
I.G., GP 723091 (*Fr.-Bayer*, I-1, 1043)BIOS-MISC 20, App. 75 (Details of dyeing and fastness
properties)**13990 C.I. Mordant Yellow 18 (Dull greenish yellow)**

Aniline → Salicylic acid

 H_2SO_4 conc. — reddish orange HNO_3 conc. — reddish orange solution*Discoverer* — J. H. Stebbins 1880Stebbins, *Ber.* **13** (1880), 716Limpricht, *Ann.* **263** (1891), 224v. Kostanecki & Zibell, *Ber.* **24** (1891), 1696Dierbach, *Ann.* **273** (1893), 117Fischer & Schaar-Rosenberg, *Ber.* **52** (1899), 81Hewitt & Fox, *JCS*, **79** (1901), 50Grandmougin, *Ber.* **39** (1906), 3930Grandmougin & Guisan, *Rev. gén. Mat. col.* **12** (1908), 129

Soluble in water and in ethanol, acetone and ether

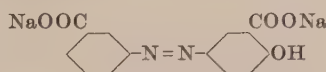
Slightly soluble in benzene

13995 C.I. Mordant Yellow 57 (Dull reddish yellow)

Anthranilic acid → Salicylic acid

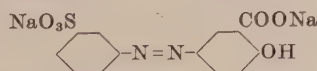
Discoverers — R. Lauch and C. Krekeler 1889Bayer Co., *FP* 198521; *GP* 58271 (*Fr.* **3**, 614)Grandmougin & Guisan, *Rev. gén. Mat. col.* **12** (1908), 129Morgan & Main Smith, *JCS*, **121** (1922), 2866Morgan & Main Smith, *JSDC*, **41** (1925), 233

Soluble in water (yellow)

 H_2SO_4 conc. — pale yellow; on dilution — yellow ppt.Aqueous solution + HCl — yellow;+ NaOH — greenish yellow**14000 Mordant Dye***m*-Aminobenzoic acid → Salicylic acid

Slightly soluble in water (yellow)

Soluble in ethanol

 H_2SO_4 conc. — reddish yellow; on dilution — yellow gelatinous ppt;Aqueous solution + HCl — yellow ppt;+ NaOH — yellow ppt.*Discoverers* — R. Lauch and C. Krekeler 1889**Diamond Yellow G paste (By)**Dyes chrome-mordanted wool greenish yellow. Used as a
substitute for fustic in wool dyeing and for Persian berries
in calico printingBayer Co., *BP* 8299/89; *FP* 198521; *GP* 58271 (*Fr.* **3**, 614)Morgan & Main Smith, *JCS*, **121** (1922), 2866Morgan & Main Smith, *JSDC*, **41** (1925), 233**14005 Mordant Dye**

Metanilic acid → Salicylic acid

Discoverer — R. Nietzki 1889**Mordant Yellow 3GS (B)**Grandmougin & Guisan, *Rev. gén. Mat. col.* **12** (1908), 129

Soluble in water (greenish yellow)

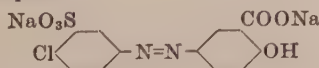
Very slightly soluble in ethanol

 H_2SO_4 conc. — greenish yellow; on dilution — pale greenish
yellowAqueous solution + HCl conc. — greenish yellow;+ NaOH conc. — golden yellow**14006 C.I. Acid Yellow 98 (Dull greenish yellow)**

A chromium complex of C.I.14005

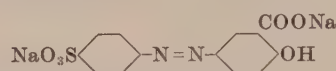
Treat the isolated dye from C.I.14005 with chromium formate in
aqueous solution at 90°C and evaporate to dryness*Discoverer* — H. KämmererI.G., *BP* 294743; *USP* 1727468; *FP* 647514; *Sw.P* 132033;
GP 468576 (*Fr.* **16**, 968)*FIAT* 764 — Palatinechtgelb 3GN**14007 C.I. Acid Yellow 120 (Yellow)**

A chromium complex of



6-Chlorometanilic acid → Salicylic acid;

then convert to the chromium complex

14010 C.I. Mordant Yellow 10 (Dull greenish yellow)

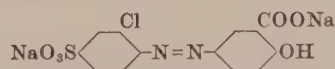
Sulfanilic acid → Salicylic acid

Aqueous solution + HCl conc. — yellow;
+ NaOH conc. — yellow

Discoverer — P. Griess

Griess, *Ber.* **11** (1878), 2196
Stebbins, *Ber.* **13** (1880), 716
Limpricht, *Ann.* **263** (1891), 226

Very soluble in water (yellow)
Very slightly soluble in ethanol, Cellosolve and chloroform
Insoluble in other organic solvents
H₂SO₄ conc. — reddish yellow; on dilution — yellow solution and ppt.
HNO₃ conc. — yellow solution

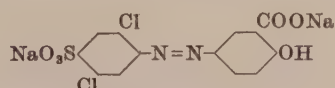
14015 Mordant Dye

3-Chlorosulfanilic acid → Salicylic acid

Discoverer — Griesheim-Elektron

Cloth Yellow GN, Chrome Fast Yellow UG (GrE)

Soluble in water (greenish yellow)
Very slightly soluble in ethanol
H₂SO₄ conc. — golden yellow; on dilution — very pale greenish yellow
Aqueous solution + HCl conc. — greenish yellow;
+ NaOH conc. — orange

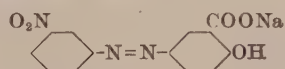
14020 C.I. Mordant Yellow 24 (Dull yellow → Dull reddish yellow)

2,5-Dichlorosulfanilic acid → Salicylic acid

Discoverer — H. Oster 1909

Agfa, *BP* 13917/09; *USP* 949633; *FP* 414701; *GP* 222991
(*Fr.* **10**, 837)
FIAT 764 — Chromechtgelb RR ex.

Soluble in water
Moderately soluble in ethanol (greenish yellow)
H₂SO₄ conc. — orange to red; on dilution — pale greenish yellow
HNO₃ conc. — orange red
Aqueous solution + HCl conc. — greenish yellow;
+ NaOH conc. — orange

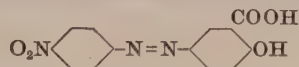
14025 C.I. Mordant Yellow 1 (Dull yellow)

m-Nitroaniline → Salicylic acid

Soluble in water (yellow)
Slightly soluble in ethanol, acetone and Cellosolve
Insoluble in other organic solvents
H₂SO₄ conc. — orange; on dilution — pale greenish yellow
HNO₃ conc. — reddish yellow solution
Aqueous solution + HCl conc. — pale greenish yellow ppt;
+ NaOH conc. — brownish orange

Discoverer — R. Nietzki 1887

M.L.B., *BP* 17583/87; *USP* 424019; *FP* 187821; *GP* 44170
(*Fr.* **2**, 323)
Geigy, *BP* 13920/88; *FP* 193190
BIOS 1548, 81
FIAT 764 — Alizaringelb GG Tg, Beizengelb GT
Nietzki, *JSDC*, **5** (1889), 175
Gebek, *Ann.* **251** (1889), 188
Grandmougin, *Ber.* **39** (1906), 3930
Morgan & Main Smith, *JCS*, **121** (1922), 2866; *JSDC*, **41** (1925), 233
Brass & Wittenberger, *Ber.* **68** (1935), 1905
Whitmore & Revukas, *JACS*, **62** (1940), 1687

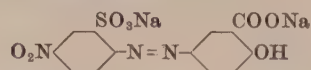
14030 C.I. Mordant Orange 1 (Dull yellowish orange → Brown)

p-Nitroaniline → Salicylic acid

Some brands consist of the sodium salt e.g. Mordant Yellow 3R

Soluble in water and ethanol (golden yellow)
Slightly soluble in acetone and Cellosolve
Insoluble in other organic solvents
H₂SO₄ conc. — reddish yellow; on dilution — pale greenish yellow ppt.
HNO₃ conc. — yellow to amber solution
Aqueous solution + HCl conc. — greenish yellow ppt;
+ NaOH conc. — reddish orange brown

Discoverers — R. Meldola 1885; R. Nietzki 1887; Walter 1888
M.L.B., *BP* 17583/87; *USP* 424019; *FP* 187821; *GP* 44170
(*Fr.* **2**, 323)
Geigy, *BP* 13920/88; *USP* 431279; *FP* 193190
BIOS 1548, 82
FIAT 764 — Alizaringelb R Tg, Beizengelb 3R
Meldola, *JCS*, **47** (1885), 666
Hewitt & Fox, *JCS*, **79** (1901), 53
Grandmougin, *Ber.* **39** (1906), 3930
Grandmougin & Guisan, *Rev. gén. Mat. col.* **12** (1908), 129
Möhlau & Maetzel, *Ber.* **46** (1913), 447, 454
Morgan & Main Smith, *JCS*, **121** (1922), 2866; *JSDC*, **41** (1925), 233
Rowe, *JSDC*, **41** (1925), 7
Seyewetz & Chaix, *Bull. Soc. chim.* **41** (1927), 332
Whitmore & Revukas, *JACS*, **62** (1940), 1687

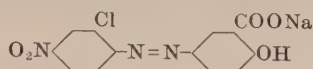
14035 C.I. Mordant Orange 15 (Orange)

2-Amino-5-nitrobenzenesulfonic acid → Salicylic acid

Discoverer — B. Richard 1909

Geigy, *BP* 10899/10; *USP* 991750; *FP* 419642; *GP* 226242
(*Fr.* **10**, 836)

Soluble in water (orange yellow) and ethanol (orange)
H₂SO₄ conc. — yellowish orange; on dilution — yellow solution and pale yellowish ppt.
Aqueous solution + HCl — paler solution;
+ NaOH conc. — bluish red solution

14040 C.I. Mordant Orange 2 (Reddish orange)

2-Chloro-4-nitroaniline → Salicylic acid

Discoverer — Agfa 1908

Agfa, *FP* 401092; *GP* 215264 (*Fr.* 9, 334)

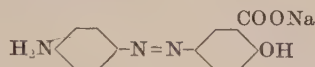
FIAT 764 — Metachromorange 3R dopp.

Soluble in water and ethanol (yellow)

H₂SO₄ conc. — golden orange; on dilution — pale golden yellow

Aqueous solution + HCl conc. — greenish yellow;

+ NaOH conc. — wine red

14045 C.I. Mordant Yellow 12 (Bright yellow)

(a) Reduce the nitro group in C.I.14030 with sodium sulfide, or

(b) Hydrolyse the amide group in C.I.14055

Discoverer — R. Meldola 1885

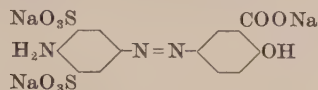
Meldola, *JCS*, 47 (1885), 667

Soluble in water (reddish yellow)

Slightly soluble in ethanol and acetone

H₂SO₄ conc. — dull yellow; on dilution — orange

HNO₃ conc. — orange solution

14050 Mordant Dye (Greenish yellow)

2,5-Diamino-*m*-benzenedisulfonic acid → Salicylic acid

Discoverer — C. Heidenreich 1921

Chrome Brilliant Yellow 3G (By)

Bayer Co., *USP* 1474587; *GP* 367862 (*Fr.* 14, 972)

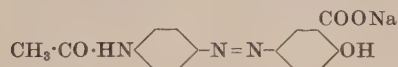
Soluble in water (greenish yellow)

Very slightly soluble in ethanol

H₂SO₄ conc. — greenish yellow; on dilution — pink to pale orange

Aqueous solution + HCl conc. — yellowish brown;

+ NaOH conc. — golden yellow

14055 C.I. Mordant Yellow 14 (Dull greenish yellow)

p-Aminoacetanilide → Salicylic acid

Discoverer — Bayer Co. 1895

FIAT 764 — Alizarin gelb 3G

Soluble in water (yellow to reddish yellow)

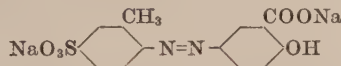
Slightly soluble in ethanol and acetone

H₂SO₄ conc. — golden yellow; on dilution — pale orange

HNO₃ conc. — orange solution

Aqueous solution + HCl conc. — brownish olive ppt.;

+ NaOH conc. — golden orange

14058 C.I. Mordant Yellow 60 (Dull yellow)

4-Amino-*m*-toluenesulfonic acid → Salicylic acid

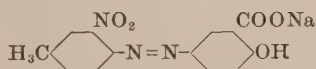
Discoverer — G. Walter 1888

Persian Yellow (Gy)

Dyes chromed wool yellow, also used in calico printing with chromium acetate

Geigy, *BP* 13920/88; *USP* 431297; *FP* 193190

Grandmougin & Guisan, *Ber.* 40 (1907), 4207

14060 Mordant Dye

2-Nitro-*p*-toluidine → Salicylic acid

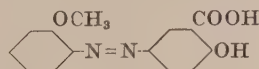
Aqueous solution + HCl — yellow ppt;

+ NaOH — orange brown

M.P. (yellow needles from dilute ethanol) 213°C

Soluble in boiling water or boiling ethanol (yellow)

H₂SO₄ conc. — orange yellow; on dilution — brownish yellow ppt.

14070 C.I. Solvent Yellow 20 (Bright yellow)

o-Anisidine → Salicylic acid

Chrome Fast Yellow GG (A)

Dyes chromed wool and silk greenish yellow of excellent fastness to light and milling. Also used in calico printing with a chrome mordant

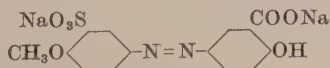
Agfa, *BP* 12221/95; *GP* 84772 (*Fr.* 4, 790)

Aqueous solution + HCl — yellow ppt, garnet red and gelatinous with excess; + NaOH — orange red solution and ppt.

M.p. (uncrystallised) 200°C

Soluble in boiling water (yellow)

H₂SO₄ conc. — yellowish brown; on dilution — yellowish red then yellow solution with yellow ppt.

14075 C.I. Mordant Yellow 51 (Greenish yellow)

6-Methoxymetanilic acid → Salicylic acid

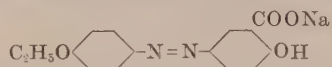
Discoverer — Griesheim-Elektron

Soluble in water (yellow)

H₂SO₄ conc. — orange

HNO₃ conc. — orange

NaOH dil. — intense yellow solution

14080 C.I. Mordant Yellow 38 (Greenish yellow)*p*-Phenetidine → Salicylic acid

Agfa, *BP* 12221/95; *GP* 84772 (*Fr.* 4, 790)
 Grandmougin & Guisan, *Rev. gén. Mat. col.* **12** (1908), 129

Soluble in hot water (yellowish brown) and ethanol (yellow)
 H_2SO_4 conc. — orange brown; on dilution — orange, then yellow ppt.
 Aqueous solution + HCl — yellow ppt., reddened by excess;
 + NaOH conc. — orange

14085 Mordant Dye

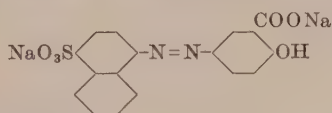
Benzidine ↗ Salicylic acid
 \;
 then treat with sodium sulfite

Discoverer — M. Lange 1891

Chrome Yellow G (By)

Dyes chrome-mordanted wool brownish yellow
 Lange, *GP* 68953 (*Fr.* 3, 706)

Soluble in water (yellow)
 Slightly soluble in ethanol
 H_2SO_4 conc. — bordeaux red; on dilution — yellow ppt.
 Aqueous solution + HCl — light brown ppt;
 + NaOH — yellowish red

14090 C.I. Mordant Yellow 28 (Dull reddish yellow)

Naphthionic acid → Salicylic acid

Discoverer — R. Nietzki 1890

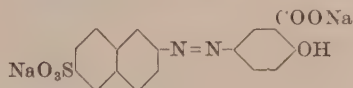
FP 206755

FIAT 764 — Beizengelb RL, Chromgelb BR
 Grandmougin & Guisan, *Ber.* **40** (1907), 3450

Soluble in water (greenish yellow)
 Moderately soluble in ethanol (greenish yellow)
 H_2SO_4 conc. — magenta red (+ orange); on dilution — yellow
 Aqueous solution + HCl conc. — yellow;
 + NaOH conc. — yellowish brown

14091 C.I. Acid Yellow 100 (Dull reddish yellow)

A chromium complex derived from C.I.14090

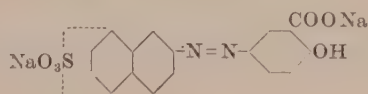
Inochrome Yellow R (Fran)**14095 C.I. Mordant Yellow 3 (Dull yellow)**

Broenner's acid → Salicylic acid

Discoverer — Dahl Co. 1891

Dahl Co., *FP* 206755; *GP* ap. D4787 (*Fr.* 3, 649)*FIAT* 764 — Anthracengelb BN ex. kz.

Soluble in water (yellow)
 Very slightly soluble in ethanol and acetone
 Insoluble in benzene
 H_2SO_4 conc. — brownish orange; on dilution — reddish yellow
 HNO_3 conc. — orange
 Aqueous solution + HCl conc. — olive yellow;
 + NaOH conc. — golden orange

14100 C.I. Mordant Yellow 32 (Dull greenish yellow)

6(and 7)-Amino-1-naphthalenesulfonic acid → Salicylic acid

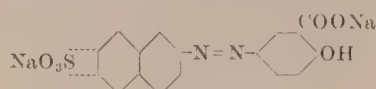
Discoverer — R. Nietzki 1890

Dahl Co., *FP* 206755; *GP* ap. D4787 (*Fr.* 3, 649)*FIAT* 764 — Beizengelb G

Soluble in water (greenish yellow)
 Slightly soluble in ethanol (greenish yellow)
 H_2SO_4 conc. — golden orange; on dilution — pale yellow
 Aqueous solution + HCl conc. — greenish yellow;
 + NaOH conc. — golden orange

14101 C.I. Acid Yellow 185 (Yellow)

A chromium complex derived from C.I. 14100

14105 Mordant Dye (Dull greenish yellow)

6(and 7)-Amino-2-naphthalenesulfonic acid → Salicylic acid

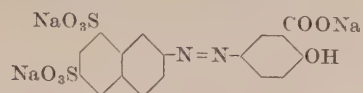
Discoverer — R. Nietzki 1890

Mordant Yellow GS (By)

Very closely similar in properties to C.I. Mordant Yellow 32
 (C.I.14100)

Dahl Co., *FP* 206755; *GP* ap. D4787 (*Fr.* 3, 649)

Soluble in water (greenish yellow)
 Very slightly soluble in ethanol
 H_2SO_4 conc. — brownish orange; on dilution — pale greenish yellow
 Aqueous solution + HCl conc. — greenish yellow;
 + NaOH conc. — golden yellow

14110 C.I. Mordant Yellow 20 (Dull reddish yellow)

7-Amino-1,3-naphthalenedisulfonic acid → Salicylic acid

Aqueous solution + HCl conc. — yellow;
+ NaOH conc. — orange

Discoverer — Hirschberger 1894

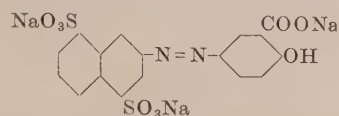
Levinstein Ltd., BP 12145/94; GP 87483 (Fr. 4, 789)
Morgan & Main Smith, JCS, 121 (1922), 2866; JSDC, 41 (1925), 233

BIOS 1548, 80

FIAT 764 — Alizarin gelb CY

Soluble in water (greenish yellow)

Insoluble in ethanol

H₂SO₄ conc. — brownish orange; on dilution — greenish yellow**14115 C.I. Mordant Yellow 44 (Reddish yellow)**

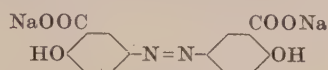
3-Amino-1,5-naphthalenedisulfonic acid → Salicylic acid

Very soluble in water (yellow)

Insoluble in organic solvents

H₂SO₄ conc. — yellowish orange

HCl conc. — yellowish orange

14130 C.I. Mordant Yellow 5 (Dull greenish yellow)

5-Amino-2-chlorobenzoic acid → Salicylic acid;

and heat under pressure with aqueous sodium hydroxide in presence of a little copper powder or copper oxide at 135–150°C

Discoverer — C. Mettler 1913

Geigy, BP 22070/14; USP 1157169; GP 278613 (Fr. 12, 323)

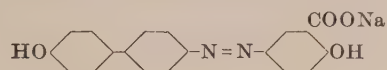
FIAT 764 — Chromgelb A ex.

Soluble in water (greenish yellow)

Moderately soluble in ethanol (greenish yellow)

H₂SO₄ conc. — yellowish orange; on dilution — very pale yellowHNO₃ conc. — red

Aqueous solution + HCl conc. — colour reduced to very pale yellow; + NaOH conc. — golden orange

14135 C.I. Mordant Yellow 36 (Greenish yellow)Benzidine ↗ Salicylic acid
↘;

then boil with dilute sulfuric acid in order to exchange the remaining diazo group for an hydroxy group

(Diamond Flavine G contains approximately 6% of the corresponding dye from *o*-tolidine)

Discoverer — M. Kahn 1891

Badische Co., GP 52661 (Fr. 2, 470)

Bayer Co., BP 11663/91; FP 214756; GP 60373 (Fr. 3, 641)

FIAT 764 — Diamantflavin G

Moderately soluble in water (greenish yellow)

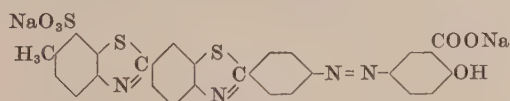
Slightly soluble in ethanol, acetone and Cellosolve

Insoluble in other organic solvents

H₂SO₄ conc. — reddish violet; on dilution — pale yellow (greenish brown ppt.)

Aqueous solution + HCl conc. — pale brownish olive;

+ NaOH conc. — orange

14140 C.I. Direct Yellow 10 (Reddish yellow)

Primuline (C.I.49000) → Salicylic acid

Discoverer — G. Walter 1888

Geigy, USP 398990; FP 196988

Dahl Co., FP 192628; GP 48465 (Fr. 2, 294)

FIAT 764 — Baumwollgelb R

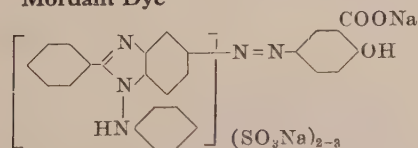
Soluble in water (golden yellow)

Slightly soluble in ethanol

H₂SO₄ conc. — brownish orange; on dilution — lemon yellow

Aqueous solution + HCl conc. — golden yellow ppt;

+ NaOH conc. — orange brown ppt.

14150 Mordant DyeDi (and tri) sulfonated-5-amino-1-anilino-2-phenylbenzimidazole
→ Salicylic acid

(To make the diazo component treat Chrysoidine (C.I.11270) with benzaldehyde and sulfonate the product. For structure see Fischer)

Discoverers — E. Nölting and W. Herzberg 1895

Chrome Fast Yellow G (A)

Dyes chrome mordanted wool yellow

Nölting & Wegelin, Ber. 30 (1897), 2595

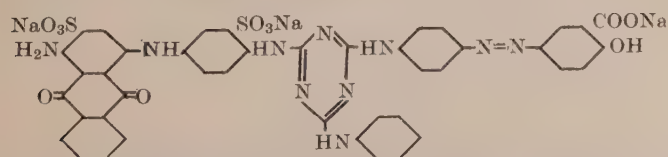
O. Fischer, J. prakt. Chem. NF107 (1924), 39

Soluble in water and ethanol (orange yellow)

H₂SO₄ conc. — orange yellow; on dilution — paler solution

Aqueous solution + HCl — yellow flocculent ppt;

+ NaOH conc. — unaltered

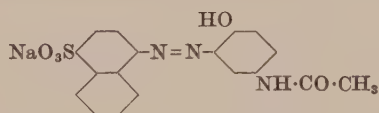
14155 C.I. Direct Green 28 (Bright yellowish green)Condense cyanuric chloride successively with 1 mol. each of 2-amino-5-(4-amino-3-sulfo-1-anthraquinonylamino)benzenesulfonic acid, the monoazo dye 5-(*p*-aminophenylazo)-salicylic acid and aniline

Discoverers — H. Gubler and E. Bernasconi 1934

Ciba, BP 466886; USP 2167804; Sw.P 217241, 220647

Frahm, Chem. Weekbl. 48 (1952), 127

14160 Mordant Dye



Naphthionic acid → *p*-Hydroxyacetanilide

Discoverer — Dahl Co. 1902

Anthracyl Chrome Blue 724 (By)

An afterchrome dye

Dahl Co., *BP* 2991/03; *GP* 146265 (*Fr.* 7, 417)

FIAT 764 — Anthracylchromblau D724

Soluble in water

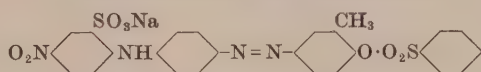
Slightly soluble in ethanol (golden yellow)

H₂SO₄ conc. — magenta red; on dilution — greenish yellow

Aqueous solution + HCl conc. — golden yellow;

+ NaOH conc. — reddish orange to brown

14170 C.I. Acid Yellow 65 (Dull reddish yellow)



2-(*p*-Aminoanilino)-5-nitrobenzenesulfonic acid → *o*-Cresol;
then esterify with benzenesulfonyl chloride

BIOS 961, 26

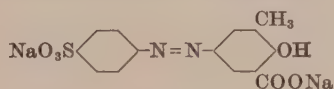
FIAT 764 — Echtseidengelb G

Soluble in water (yellow) and ethanol

Slightly soluble in acetone and toluene

H₂SO₄ conc. — violet

14180 C.I. Mordant Yellow 27 (Dull yellow)



Sulfanilic acid → 2,3-Cresotic acid

Soluble in water (yellow)

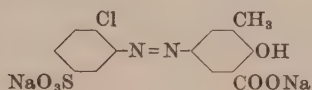
H₂SO₄ conc. — golden yellow; on dilution — yellow ppt.

Aqueous solution + HCl conc. — orange;

+ H₂SO₄ 10% — unaltered;

+ NaOH conc. — orange

14185 Mordant Dye

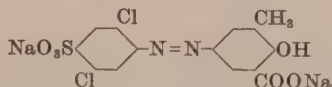


4-Chlorometanilic acid → 2,3-Cresotic acid

Discoverer — Griesheim-Elektron

Oxychrome Yellow G (GrE)

14190 C.I. Mordant Yellow 9 (Dull yellow → Reddish yellow)



2,5-Dichlorosulfanilic acid → 2,3-Cresotic acid

Discoverer — H. Oster 1909

Agfa, *BP* 13917/09; *USP* 949633; *FP* 414701; *GP* 222991
(*Fr.* 10, 837)

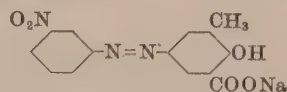
Soluble in water (yellow)

H₂SO₄ conc. — deep yellowish red

HNO₃ conc. — insoluble

NaOH dil. — yellowish red solution

14195 Mordant Dye



m-Nitroaniline → 2,3-Cresotic acid

Discoverer — R. Nietzki 1887

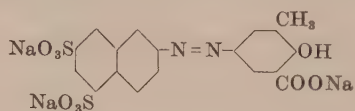
Chrome Yellow 24745 (By)

M.L.B., *BP* 17583/87; *USP* 424019; *FP* 187821; *GP* 46203
(*Fr.* 2, 324)

Geigy, *BP* 13920/88; *GP* 193190

Fierz, *JSCI*, **41** (1922), 517R

14200 Mordant Dye



6-Amino-1,3-naphthalenedisulfonic acid → 2,3-Cresotic acid

Discoverer — Bayer Co. 1912

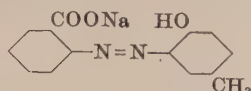
Chrome Yellow RO (By)

Soluble in water (greenish yellow); almost insoluble in ethanol

H₂SO₄ conc. — golden orange; on dilution — pale yellow

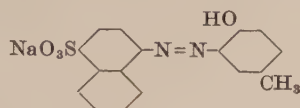
Aqueous solution + HCl conc. — greenish yellow;

+ NaOH conc. — brownish orange

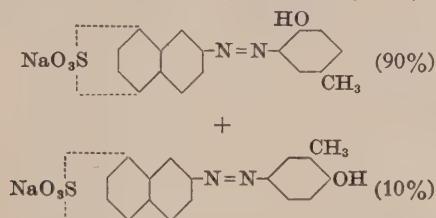
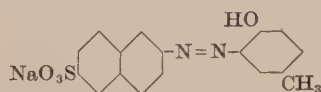
14210 C.I. Mordant Red 32 (Bordeaux)Anthranilic acid → *p*-Cresol*Discoverer* — E. Münch 1903Badische Co., *BP* 7396/03; *USP* 737445; *FP* 338494; *GP* 151279 (*Fr.* 7, 416)Drew & Landquist, *JCS* (1938), 292

Soluble in water (golden yellow)

Moderately soluble in ethanol

 H_2SO_4 conc. — orange, brown; on dilution — pale brownish orangeAqueous solution + HCl conc. — golden orange ppt;
+ NaOH conc. — golden orange**14220 C.I. Mordant Violet 41 (Bluish violet)**Naphthionic acid → *p*-Cresol*Discoverer* — Pick, Lange & Co. 1901Pick, Lange & Co., *GP* 133480 (*Fr.* 6, 932)Brotherton & Co., *BP* ap. 14035 of 30/7/19

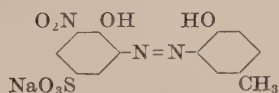
Soluble in water

 H SO_4 conc. — dull reddish violet; on dilution — yellow HCl — unaltered NaOH — crimson solution**14225 C.I. Acid Yellow 20 (Dull reddish yellow)**6(and 7)-Amino-1-naphthalenesulfonic acid →
[*p*-Cresol(0.9 mol.) + *o*-Cresol(0.1 mol.)]*Discoverer* — Badische Co.*Dyes of similar constitution*—Pick, Lange & Co., *GP* 133480 (*Fr.* 6, 932)*FIAT* 764 — Palatinlichtgelb RX**14230 C.I. Acid Yellow 21 (Reddish yellow)**Broenner's acid → *p*-Cresol**Acid Light Yellow JR (Fran)***Dyes of similar constitution* —Pick, Lange & Co., *GP* 133480 (*Fr.* 6, 932)

Very soluble in water (yellow)

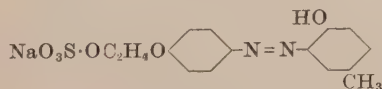
Soluble in ethanol and acetone

Slightly soluble in benzene

 H_2SO_4 conc. — red**14235 C.I. Mordant Brown 22 (Dull brown)**2-Amino-6-nitro-1-phenol-4-sulfonic acid → *p*-Cresol*Discoverers* — K. Holzach, H. Krzikalla and W. Müller 1928I.G., *BP* 325208; *USP* 1867083; *FP* 671081; *GP* 541195 (*Fr.* 18, 1025)*FIAT* 764 — Saeureanthracenbraun WSG

Soluble in water (yellowish brown)

Moderately soluble in ethanol

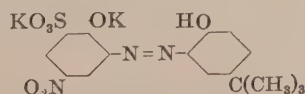
 H_2SO_4 conc. — yellowish brown; on dilution — pale orangeAqueous solution + HCl conc. — orange;+ NaOH conc. — orange brown**14240 Acid Dye (Greenish yellow → yellow)***(a) 2-(*p*-Aminophenoxy)ethanol sulfuric ester → *p*-Cresol, or(b) 2-(*p*-Aminophenoxy)ethanol → *p*-Cresol;

then esterify with sulfuric acid

* On acetate rayon

Solacet Fast Yellow 3 G (ICI)*Discoverer* — A. H. Knight 1934I.C.I., *BP* 441089; *FP* 792409; *GP* 645423 (*Fr.* 24, 738)
BP 466799; *GP* 673909 (*Fr.* 25, 668)

Soluble in water (greenish yellow) and ethanol

14250 C.I. Mordant Brown 19 (Reddish brown)

6-Amino-4-nitro-1-phenol-2-sulfonic acid

(KOH) → *p*-tert-ButylphenolGeigy, *BP* 450127; *USP* 2052477; *FP* 796510; *GP* 653026 (*Fr.* 24, 663)*BIOS* 961, 60*FIAT* 764 — Saeureanthracenbraun LE

Soluble in water (brown), ethanol and Cellosolve

Insoluble in other organic solvents

 H_2SO_4 conc. — red; on dilution — orange red solution and ppt. HNO_3 conc. — orange solution, turns yellow NaOH 10% — reddish brown solution

14251 C.I. Acid Brown 42 (Reddish brown)

A chromium complex derived from C.I.14250
Treat C.I. 14250 with chromium formate

BIOS 961, 72

FIAT 764 — Palatinechtbraun RN

Soluble in water (brown) and ethanol
Slightly soluble in Cellosolve
H₂SO₄ conc. — yellow brown; on dilution — reddish brown
HNO₃ conc. — partial solution (reddish brown)
H₂SO₄ 10% — partial solution (reddish brown)
NaOH 10% — partial solution (reddish brown)

14260 Leather Dye

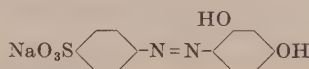
An oxidation product of



2-(*p*-Aminoanilino)-5-nitrobenzenesulfonic acid → Pyrocatechol
then oxidise with manganese dioxide

Igenal Brown CH (IG)

FIAT 764 — Igenalbraun CH

**14270 C.I. Acid Orange 6 (Yellowish orange)
C.I. Food Yellow 8**

Sulfanilic acid → Resorcinol

(The exact constitution varies according to the coupling method used. Some products are probably mixtures of isomers. Acid Yellow TS (FIAT 764) is coupled in acetic acid medium and Tropaeolin O (FIAT 764) in bicarbonate medium. See C.I.11920)

Aqueous solution + HCl conc. — golden yellow;
+ NaOH conc. — brownish orange

Discoverers — P. Griess 1875; O. N. Witt 1876

FIAT 764 — Saeuregelb RS 166, Saeuregelb TS, Tropaeolin O

Griess, *Ber.* **11** (1878), 2195

Witt, *JCS*, **35** (1879), 183

Hartley, *JCS*, **51** (1887), 182 (Spectrum)

Sisley, *Bull. Soc. chim.* **25** (1901), 862

Seyewetz & Chaix, *Bull. Soc. chim.* **41** (1927), 332

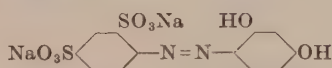
Cross, *JSDC*, **61** (1945), 75

Soluble in water (golden yellow), ethanol (lemon yellow), acetone and Cellosolve

Insoluble in other organic solvents

H₂SO₄ conc. — yellow; on dilution — lemon yellow

HNO₃ conc. — yellow solution

14275 Acid Dye

4-Amino-*m*-benzenedisulfonic acid → Resorcinol

Discoverer — Badische Co.

Chrysoin SGX Specially Pure (B)

FIAT 764 — Chrysoin SGX bes. rein

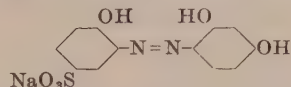
Soluble in water (lemon yellow)

Slightly soluble in ethanol

H₂SO₄ conc. — golden yellow; on dilution — golden yellow

Aqueous solution + HCl conc. — lemon yellow;

+ NaOH conc. — reddish orange

14290 C.I. Mordant Red 5 (Dull red → Bordeaux)

2-Amino-1-phenol-4-sulfonic acid → Resorcinol

Discoverers — E. Erdmann and O. Borgman 1893

Erdmann & Borgmann, *GP* 78409 (*Fr.* **4**, 785)

FIAT 764 — Anthracenchromrot A

Drew & Dunton, *JCS*, (1940), 1067

Soluble in water (orange to brownish orange)

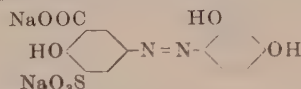
Slightly soluble in ethanol (yellowish orange) and acetone

H₂SO₄ conc. — reddish yellow; on dilution — paler

HNO₃ conc. — orange brown solution

14295 C.I. Acid Brown 144 (Bright yellowish brown)*

A chromium complex derived from



5-Amino-3-sulfosalicylic acid → Resorcinol;

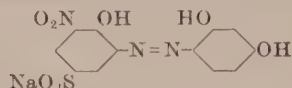
then isolate the dye and treat with chromium formate to form the chromium complex

* On leather

Discoverer — H. Krzikalla 1929

I.G., *BP* 352004; *USP* 1840398; *FP* 704180; *GP* 548225 (*Fr.* **18** 1028)

FIAT 764 — Erganihellbraun C

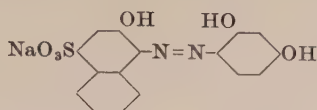
14300 C.I. Mordant Red 67 (Bordeaux)

2-Amino-6-nitro-1-phenol-4-sulfonic acid → Resorcinol

H₂SO₄ conc. — slightly brownish yellow; on dilution — reddish yellow

HCl — orange solution

NaOH — orange solution

14305 Mordant Dye

1-Amino-2-naphthol-4-sulfonic acid → Resorcinol

Discoverer — Weiler-ter-Meer 1903

Salicine Black RLF (K)

Weiler-ter-Meer, *GP* 155083 (*Fr.* 7, 405)

Badische Co., *BP* 4997/04; *FP* 338819; *GP* 160536 (*Fr.* 8, 657)

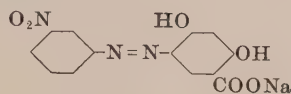
Kalle Co., *GP* 195228 (*Fr.* 8, 1379)

Agfa, *GP* 196923 (*Fr.* 9, 355)

Soluble in water (reddish orange brown) and ethanol (yellowish brown)

H₂SO₄ conc. — violet; on dilution — wine red

Aqueous solution + HCl conc. — orange brown;
+ NaOH conc. — reddish brown

14320 Mordant Dye

m-Nitroaniline → β-Resorcylic acid

Discoverer — F. Muhlert 1894

Prague Alizarin Yellow G (Ki)

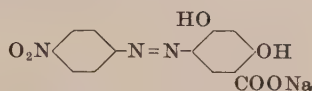
Dyes chromed wool brownish yellow and chromed cotton yellow, also used in calico printing with chrome acetate

Kinzlberger Co., *USP* 528965; *GP* 81501 (*Fr.* 4, 786)

Soluble in water and ethanol (yellow)

H₂SO₄ conc. — yellow; on dilution — yellow ppt.

Aqueous solution + HCl — yellow ppt;
+ NaOH — orange yellow

14325 Mordant Dye

p-Nitroaniline → β-Resorcylic acid

Discoverer — F. Muhlert 1894

Prague Alizarin Yellow R (Ki)

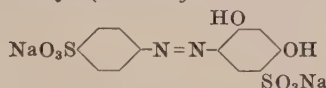
Dyes chromed wool and cotton orange-yellow

Kinzlberger Co., *USP* 528965; *GP* 81501 (*Fr.* 4, 786)

Soluble in water and ethanol (orange yellow)

H₂SO₄ conc. — orange yellow; on dilution — orange yellow ppt.

Aqueous solution + HCl — orange yellow ppt;
+ NaOH — bluish violet

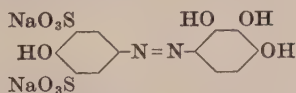
14330 Acid Dye (Reddish yellow → Yellowish orange)

Sulfanilic acid → 2,4-Dihydroxybenzenesulfonic acid

It is improbable that a dye of this constitution has ever been made. See C.I. 20281 for correct constitution of C.I. Food Yellow 9, previously recorded as C.I. 14330

Soluble in water

Slightly soluble in ethanol

14340 C.I. Mordant Brown 41 (Reddish brown)

4-Amino-1-phenol-2,6-disulfonic acid → Pyrogallol

Discoverer — C. Ris 1893

Ciba, *BP* 11902/93; *USP* 548460; *FP* 230737; *GP* 81109 (*Fr.* 4, 797), *GP ap.* G8266 (*Fr.* 4, 799)

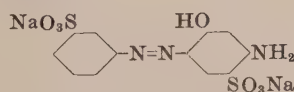
FIAT 764 — Chromrotbraun 5RD Plv.

Soluble in water (greenish yellow)

Insoluble in ethanol

H₂SO₄ conc. — yellowish brown; on dilution — greenish yellow

Aqueous solution + HCl conc. — greenish to golden yellow;
+ NaOH conc. — reddish orange brown

14345 Acid Dye

Metanilic acid → 3-Amino-1-phenol-4-sulfonic acid

Discoverer — C. Rudolph 1892

Phenoflavine (Gr E)

Oehler, *GP* 71229, 74111 (*Fr.* 3, 645, 58)

Limpricht, *Ber.* 9 (1870), 552

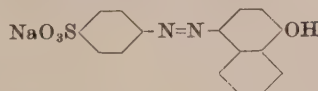
Schultz, *Ibid.* 39 (1906), 3345

Soluble in water (yellow)

H₂SO₄ conc. — yellow; on dilution — unaltered

HCl — orange solution

NaOH — orange solution

14600 C.I. Acid Orange 20 (Orange)

Classical name **Orange I**

Sulfanilic acid → 1-Naphthol

Discoverers — P. Griess 1876; Z. Roussin 1876

BIOS 1548, 75

FIAT 764 — Echtbraun D

Witt, *Ber.* 12 (1879), 258; *Chemikerztg.* 4 (1880), 437

Liebermann, *Ber.* 14 (1881), 1796;

Liebermann & Jacobson, *Ann.* 211 (1882), 61

Mühlhäuser, *Dingl.* 4 (1887), 181, 241

Bucherer & F. Hanusch, *J. prakt. Chem.*, 132 (1931), 277; cf.

JSDC, 48 (1932), 73

Rowe & W. Dangerfield, *JSDC*, 52 (1936), 54

Whitmore & Revukas, *JACS*, 59 (1937), 1501

Fierz-David, Blangey & Streiff, *Helv. Chim. Acta*, 29 (1946), 1718

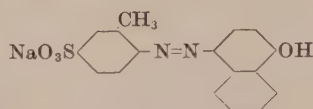
Soluble in water (brownish orange)

Slightly soluble in ethanol (yellowish brown) and acetone

Insoluble in most other organic solvents

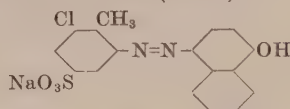
H₂SO₄ conc. — violet; on dilution — brownish orange (+ reddish violet ppt.)

Aqueous solution + HCl conc. — orange brown;
+ NaOH conc. — red

14610 C.I. Acid Brown 3 (Brown)4-Amino-*m*-toluenesulfonic acid → 1-Naphthol

BIOS 961, 44
FIAT 764 — Orange NA "F"

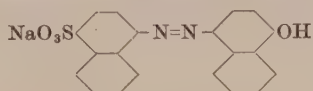
For related dyes see —
Roussin & Poirrier, *USP* 211671

14615 C.I. Acid Brown 102 (Brown)*3-Amino-5-chloro-*p*-toluenesulfonic acid → 1-Naphthol

* On leather

BIOS 961, 61, 154
FIAT 764 — Saeurelederbraun EG

(In **Acid Leather Brown EG (IG)** the coupling component consisted of 1-naphthol (92.5%), 2-naphthol (3.75%) and resorcinol (3.75%). The diazo component was the by-product from the manufacture of the diazo component for C.I.15585)

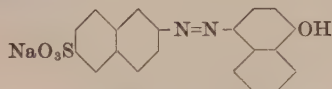
14625 C.I. Acid Brown 6 (Reddish brown)

Naphthionic acid → 1-Naphthol

Aqueous solution + HCl — magenta red and brown ppt;
+ H₂SO₄ 10% — no change;
+ NaOH — violet brown

Discoverer — H. Caro 1878
Badische Co., *BP* 786/78; *USP* 204799; *FP* 123148; *GP* 5411 (*Fr.* 1, 358)
BIOS 961, 43
FIAT 764 — Chrombraun RF, Naphthylaminbraun F
M.L.B., *BP* 9371/93; *USP* 230001; *GP* 87003 (*Fr.* 4, 1024)
Note — Was formerly used under the names *Chrome Brown RF* and *Naphthylamine Brown F* to dye wool in the presence of acid brownish-orange, converted to brown by after-chroming

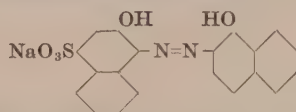
Soluble in water (brown)
H₂SO₄ conc. — violet to blue; on dilution — dull reddish violet

14630 Acid Dye

Broenner's acid → 1-Naphthol

Discoverer — H. Prinz 1882
Fast Brown 3B (A)
Farbenfabr. vorm. Brönnner, *BP* 3724/82; *USP* 332829; *FP* 150503; *GP* 2254 (*Fr.* 1, 414)
FIAT 764 — Echtbraun 3B

Soluble in water (brownish red)
H₂SO₄ conc. — blue; on dilution — reddish violet, then reddish violet ppt.
Aqueous solution + HCl conc. — reddish violet ppt;
+ NaOH conc. — magenta red

14640 C.I. Mordant Black 3 (Bluish grey → Bluish black)

1-Amino-2-naphthol-4-sulfonic acid → 1-Naphthol

Soluble in water (violet) and ethanol (red) and acetone
Insoluble in toluene
H₂SO₄ conc. — dullish blue; on dilution — pale corinth
HNO₃ conc. — yellow solution
Aqueous solution + HCl conc. — pale reddish brown;
+ NaOH conc. — wine red

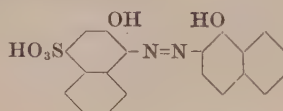
Discoverers — T. Sandmeyer, J. Hagenbach and K. Elbel 1904
Geigy, *BP* 10235/04; *USP* 793743; *FP* 349989; *GP* 171024, 181326, (*Fr.* 8, 640, 666)
Kalle Co., *BP* 23034/05; *USP* 807422; *FP* 353786; *GP* 175593, 178621, 178936, 195228, (*Fr.* 8, 648, 649, 650, 1379)
Ciba, *BP* 10022/05; *USP* 797441, 806415; *GP* 181714 (*Fr.* 8, 678).
BP 7029/06; *USP* 835539; *GP* ap. G21484 (*Fr.* 8, 681)
Badische Co., *BP* 10323/06; *FP* 365919; *GP* 162009, 189179, (*Fr.* 8, 659, 654)

(The above patents are for the most part concerned with the diazotisation of 1-amino-2-naphthol-4-sulfonic acid and the following references with the properties of 1-amino-2-naphthol-4-sulfonic acid and its diazo compound which it will be seen couples in 2 position to the hydroxy group of 1-naphthol in contrast to the 4-coupling of most other diazo components. It has been suggested (Fierz & Brütsch) that this shift in the coupling from the normal 4- to 2- is caused by the very strongly caustic alkaline conditions used for coupling C.I.14640 and C.I.14645)

Schmidt, *J. prakt. Chem.* (11) 44, 513
Böniger, *Ber.* 27 (1894), 23
Morgan & Tomlins, *JCS*, 111 (1917), 497
Morgan & Evans, *JCS*, 115 (1919), 1126
Fierz & Brütsch, *Helv. Chim. Acta*, 4 (1921), 380
Süs, *Ann.* 556 (1944), 65, 85
De Jonge & Dijkstra, *Rec. Trav. chim.* 67 (1948), 328

14641 C.I. Acid Blue 155 (Dull blue)**14641:1 Solvent Dye**

Chromium complex derived from

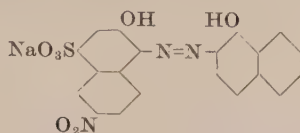


Convert C.I.14640 into a chromium complex
C.I. 14641:1 is the acid form of the dye

Inochrome Blue J (Fran)**Zapon Fast Blue G (IG)**

Solvent dye: consists of the acid form of the dye and is used in alcoholic solvents

FIAT 1313, 3, 133

14645 C.I. Mordant Black 11 (*Bluish grey* → *Bluish black*)

1-Amino-6-nitro-2-naphthol-4-sulfonic acid → 1-Naphthol

 H_2SO_4 conc. — dull blue; on dilution — pale reddish brown HNO_3 conc. — orangeAqueous solution + HCl conc. — corinth;
+ NaOH conc. — brownish magenta red

Discoverer — J. Hagenbach 1904

Geigy, *BP* 15418/04, 15982/04; *USP* 790363; *FP* 350071;
GP 164655, 169683 (*Fr.* 8, 647, 673)Kalle Co., *BP* 22200/09; *USP* 958912; *FP* 407227; *GP* 176619
(*Fr.* 8, 653), *GP ap.* K39667 (*Fr.* 10, 861)*FIAT* 764 — Chromogenschwartz ETOOBrenner, *Helv. Chim. Acta*, **3** (1920), 98Fierz & Brüttsch, *Helv. Chim. Acta*, **4** (1921), 380Ruggli, Knapp, Merz & Zimmerman, *Helv. Chim. Acta*, **12**
(1929), 1034Ruggli, A. Zimmerman & Knapp, *Helv. Chim. Acta*, **13** (1930),
748

Soluble in water (bordeaux to corinth)

Moderately soluble in ethanol (brownish magenta red)

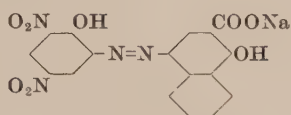
Slightly soluble in acetone

14646 C.I. Acid Violet 62 (*Dull reddish violet*)

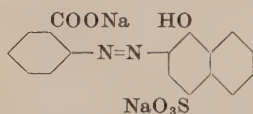
Copper complex derived from C.I.14645

Grind C.I.14645 with copper sulfate

Soluble in water (dull reddish violet) and in ethanol

 H_2SO_4 conc. — deep reddish blue; on dilution — brown flocculent
ppt. HNO_3 conc. — brown, changing rapidly to dull yellow HCl conc. — olive green; on dilution — black ppt.**14655★ Mordant Dye**

Picramic acid → 1-Hydroxy-2-naphthoic acid

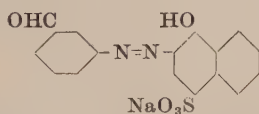
Metachrome Bordeaux R (IG)*FIAT* 764 — Metachrombordo R**14670 C.I. Mordant Violet 2** (*Reddish violet*)

Anthranilic acid → Nevile and Winther's acid

Soluble in water (red)

Slightly soluble in ethanol

Insoluble in acetone

 H_2SO_4 conc. — dull reddish violet HNO_3 conc. — pink HCl conc. — bright reddish orange**14675 Acid Dye***m*-Aminobenzaldehyde → Nevile and Winther's acidAqueous solution + HCl conc. — orange;
+ NaOH conc. — golden orange

Discoverer — K. Thiess 1923

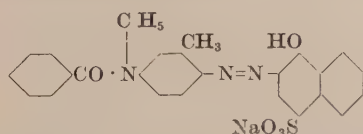
Amido Fast Red GG (IG)

Dyes wool in the presence of acid. Levelling, good

Fastness Properties (C): Light 4, Milling (alkaline) 2-3,
Perspiration 3, Washing 3M.L.B., *USP* 1540666; *FP* 573603*FIAT* 764 — Amidoechtrot GG

Soluble in water (orange)

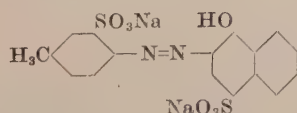
Moderately soluble in ethanol (golden orange)

 H_2SO_4 conc. — red; on dilution — orange**14680 C.I. Acid Red 6** (*Yellowish red*)4'-Amino-*N*-ethyl-*m*-benzotoluidide → Nevile and Winther's acid

Discoverer — P. Hauptmann 1914

Bayer Co., *USP* 1199890; *GP* 296964 (*Fr.* 13, 486)*BIOS* 1548, 50. *FIAT* 764 — Supraminrot B

Soluble in water (scarlet red) and ethanol (red)

 H_2SO_4 conc. — cherry red; on dilution — redAqueous solution + HCl conc. — red, ppt;+ NaOH conc. — orange**14685 Acid Dye**6-Amino-*m*-toluenesulfonic acid → Nevile and Winther's acid

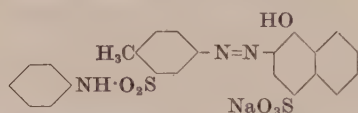
Discoverer — Griesheim-Elektron

Orange 3RL (Gr E)

Soluble in water (orange red)

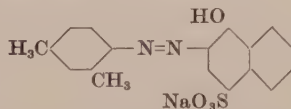
Slightly soluble in ethanol

 H_2SO_4 conc. — ruby red; on dilution — orangeAqueous solution + HCl conc. — orange red;+ NaOH conc. — orange

14690 C.I. Acid Orange 19 (Reddish orange)5-Amino-*o*-toluenesulfonanilide → Nevile and Winther's acid

Discoverers — O. Dressel, R. Kothe, and H. Hörlein 1909
Bayer Co., BP 933/10; USP 989954; FP 414294; GP 230594
(Fr. 10, 807)
FIAT 764 — Supraminrot GG

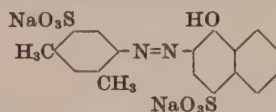
Soluble in water and ethanol (orange)
Moderately soluble in acetone
H₂SO₄ conc. — magenta red; on dilution — orange
Aqueous solution + HCl conc. — reddish orange;
+ NaOH conc. — orange

14695 C.I. Acid Red 135 (Yellowish red)

2,4-Xylidine → Nevile and Winther's acid

Discoverers — O. N. Witt, Gaess 1883

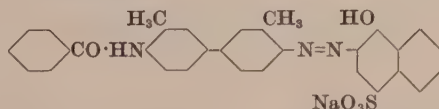
Soluble in water (red)
Slightly soluble in ethanol (orange red)
H₂SO₄ conc. — deep red; on dilution — orange red ppt.
HNO₃ conc. — scarlet; on dilution — orange
Aqueous solution + HCl — brownish red flocculent ppt;
+ NaOH — brownish yellow

14700 C.I. Food Red 1 (Bright yellowish red → Red)

5-Amino-2,4-xylenesulfonic acid → Nevile and Winther's acid

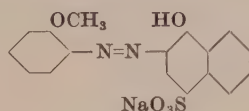
Discoverer — Warner-Jenkinson Manufacturing Co.
J. Assoc. Off. Agric. Chemists, 1954 (August), 906-912
(FD&C Red 4)

Soluble in water (yellowish red)
Slightly soluble in ethanol
H₂SO₄ conc. — deep red; on dilution — red ppt.
HNO₃ conc. — orange solution; turns yellow
Aqueous solution + HCl conc. — slightly redder;
+ NaOH conc. — orange

14705 Direct DyeMonobenzoyl-*o*-tolidine → Nevile and Winther's acid

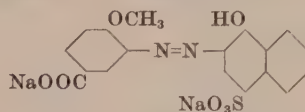
Discoverer — Chapuis 1891
Benzoyl Pink (St. D)
St. Denis, GP 60332, 65080, (Fr. 3, 24, 731)

H₂SO₄ conc. — bluish red; on dilution — violet ppt.
Aqueous solution + HCl — violet ppt;
+ NaOH — brick red

14710 C.I. Acid Red 4 (Bright red)*o*-Anisidine → Nevile and Winther's acid

Discoverer — C. Duisberg 1883
Bayer Co., BP 2237/83

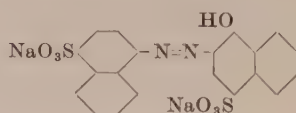
Soluble in water (red) and acetone
Slightly soluble in ethanol (orange red) and toluene
H₂SO₄ conc. — reddish violet; on dilution — pink
Aqueous solution + HCl conc. — dull red ppt;
+ HNO₃ conc. — bluish red ppt, becoming brown, then
yellow; + NaOH conc. — orange

14715 Mordant Dye (Bluish red)3-Amino-*p*-anisic acid → Nevile and Winther's acid

Discoverers — K. Krekeler and P. Kraiss 1892
Chrome Brilliant Scarlet GD (By)
Bayer Co., BP 14927/92; USP 498982; GP ap. F6114 (Fr. 3, 621)

Soluble in water (red) and ethanol (orange red)
H₂SO₄ conc. — magenta red; on dilution — red
Aqueous solution + HCl conc. — red;
+ NaOH conc. — orange

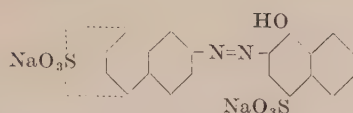
14720 C.I. Acid Red 14 (Bluish red)
C.I. Food Red 3 (Red → Bluish red)
C.I. Mordant Blue 79 (Navy)



Naphthionic acid → Nevile and Winther's acid

Discoverer — O. N. Witt 1883
Ver. Chem. Fab. (Mannheim), BP 2237/83; GP 26012 (Fr. 1, 391)
Ciba, GP 66888, 67240, (Fr. 3, 791, 793)
FIAT 764 — Chromotrop FB
Dimroth & Hilcken, Ber. 54 (1921), 3054
Morgan & Main Smith, JCS, 125 (1924), 1734
Rosenhauer, Wirth & Königer, Ber. 62 (1929), 2717 (Action of
chromates)
Fierz-David & Mannhart, Helv. Chim. Acta, 20 (1937), 1024
Standard—India IS 1964 2923 Carmoisine

Soluble in water (bluish red)
Moderately soluble in ethanol (red)
Very slightly soluble in acetone
H₂SO₄ conc. — violet; on dilution — magenta red, ppt.
HNO₃ conc. — dark red, becoming reddish yellow
Aqueous solution + HCl conc. — red;
+ NaOH conc. — reddish orange brown

14725 Acid Dye

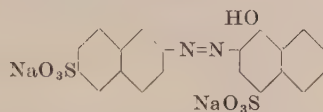
6(and 7)-Amino-1-naphthalenesulfonic acid
→ Neville and Winther's acid

Discoverer — Bayer Co. 1889

Pyrotine RRO (WDC)

Dyes wool in the presence of acid
Dahl Co., *BP* 7712/84, 7713/84, 11002/84; *GP* 29084, 30640, 32271, 32276, (*Fr.* 1, 421, 426, 424, 425)

Soluble in water (yellowish red)
Slightly soluble in ethanol
 H_2SO_4 conc. — reddish violet; on dilution — red
Aqueous solution + HCl conc. — red;
+ NaOH conc. — orange red

14730 C.I. Acid Red 102 (Red)

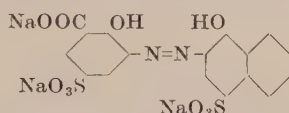
Broenner's acid → Neville and Winther's acid

Discoverer — H. Prinz 1882

Farbenfabr. vorm. Brönnner, *BP* 3724/82; *USP* 332829; *FP* 150503; *GP* 22547 (*Fr.* 1, 414)

FIAT 764 — Brillantdoppelscharlach 3R

Soluble in water (yellowish red)
 H_2SO_4 conc. — magenta red; on dilution — scarlet solution, then yellowish brown ppt.
Aqueous solution + HCl — yellow brown ppt;
+ NaOH — unaltered

14740 C.I. Mordant Violet 46 (Bright reddish violet)

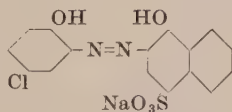
3-Amino-5-sulfosalicylic acid → Neville and Winther's acid

Discoverers — K. Krekeler and P. Kraus 1906

Bayer Co., *BP* 14927/92; *USP* 498982; *FP* 198521; *GP ap.* F6114 (*Fr.* 3, 621)

FIAT 764 — Diamantbordo R

Moderately soluble in water (red) and ethanol (orange red)
 H_2SO_4 conc. — magenta red; on dilution — orange red
Aqueous solution + HCl conc. — orange red;
+ NaOH conc. — orange

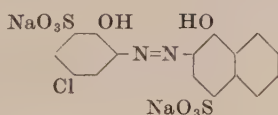
14745 C.I. Mordant Violet 40 (Dull violet)

2-Amino-4-chlorophenol → Neville and Winther's acid

Discoverer — M. Kahn 1909

FIAT 764 — Saeurechromviolett B

Soluble in water (red) and in ethanol (orange red)
 H_2SO_4 conc. — bluish violet; on dilution — red solution then brick red ppt.
Aqueous solution + HCl conc. — red;
+ NaOH conc. — orange

14750 C.I. Mordant Violet 44 (Dull bluish violet)

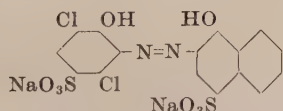
6-Amino-4-chloro-1-phenol-2-sulfonic acid
→ Neville and Winther's acid

Discoverers — M. Kahn and R. Kothe 1906

Bayer Co., *BP* 10420/07; *USP* 865253; *FP* 377381; *GP ap.* F22525 (*Fr.* 9, 344)

FIAT 764 — Saeurechromblau 5R

Soluble in water (wine red)
Moderately soluble in ethanol (red)
 H_2SO_4 conc. — violet; on dilution — reddish orange
Aqueous solution + HCl conc. — reddish orange;
+ NaOH conc. — red

14755 Mordant Dye

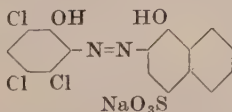
2-Amino-3,6-dichloro-1-phenol-4-sulfonic acid
→ Neville and Winther's acid

Discoverer — W. Bergdolt 1913 (Bayer Co.)

Acid Chrome Violet R (By)

Dyes of similar constitution —
Badische Co., *BP* 20551/01; *GP* 139327 (*Fr.* 6, 896)

Soluble in water (deep violet)
Moderately soluble in ethanol (corinth)
 H_2SO_4 conc. — dark corinth; on dilution — orange
Aqueous solution + HCl conc. — brownish orange;
+ NaOH conc. — golden orange

14760 C.I. Mordant Violet 4 (Dull violet)

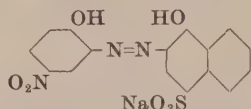
2-Amino-3,4,6-trichlorophenol → Neville and Winther's acid

Discoverers — W. Herzberg and O. Scharfenberg 1920

Agfa, *BP* 192438; *USP* 1426189-90; *GP* 364829 (*Fr.* 14, 979)

FIAT 764 — Metachrombrillantblau 8RL

Soluble in water (reddish violet)
Moderately soluble in ethanol (violet)
Insoluble in benzene
 H_2SO_4 conc. — blackish green; on dilution — orange red ppt.
 HNO_3 conc. — slightly soluble (yellowish brown)
 NaOH dil. — yellowish red solution

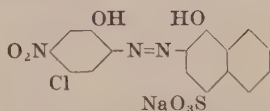
14765 C.I. Mordant Brown 35 (Dull reddish brown)

2-Amino-4-nitrophenol → Neville and Winther's acid

Discoverer — Bayer Co. 1905

FIAT 764 — Saeureanthracenbraun V

Soluble in water (violet)
Slightly soluble in ethanol (reddish violet)
H₂SO₄ conc. — magenta red; on dilution — reddish orange
Aqueous solution + HCl conc. — orange;
+ NaOH conc. — brownish orange

14770 Mordant Dye

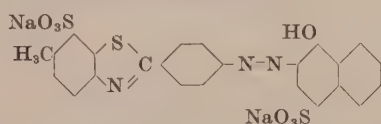
2-Amino-4-chloro-5-nitrophenol → Neville and Winther's acid

Discoverer — Bayer Co. 1905

Acid Chrome Blue R (By)

Bayer Co., BP 9264/06; FP 365415; GP 186655 (Fr. 8, 602)

Soluble in water (violet) and ethanol (wine red)
H₂SO₄ conc. — violet; on dilution — brownish orange
Aqueous solution + HCl conc. — brownish orange;
+ NaOH conc. — violet

14780 C.I. Direct Red 45 (Bluish pink → Bluish red)**C.I. Food Red 13 (Bluish red)**Dehydrothio-*p*-toluidinesulfonic acid → Neville and Winther's acid

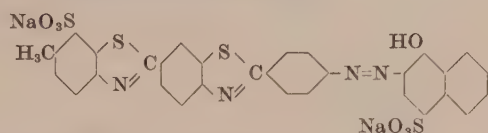
Discoverer — A. G. Green 1893

For dyes of similar constitution —

Dahl Co., USP 398990; FP 192628; GP 48465 (Fr. 2, 294)

FIAT 764 — Thiazinrot R

Very soluble in water (red to magenta red)
Soluble in ethanol (red)
H₂SO₄ conc. — reddish violet; on dilution — reddish violet, red ppt.
Aqueous solution + HCl conc. — reddish violet ppt;
+ NaOH conc. — magenta red ppt.

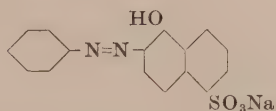
14785 C.I. Direct Red 69 (Bordeaux)

Primuline (C.I.49000) → Neville and Winther's acid

Geigy Co., USP 398990; FP 196988

Dahl Co., FP 192628; GP 48465 (Fr. 2, 294)

Soluble in water (crimson)
Insoluble in ethanol
H₂SO₄ conc. — violet red; on dilution — violet red ppt.
Aqueous solution + HCl — violet red ppt;
+ NaOH — unaltered

14800 Acid Dye

Aniline → 1-Naphthol-5-sulfonic acid

Discoverer — Gaess 1883

Cochineal Scarlet G (Sch)

Dyes wool in presence of acids moderately fast to light, milling and acids

Gaess, GP ap. G2393 (Fr. 1, 393)

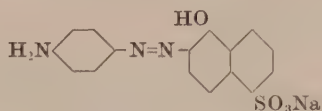
Witt, Ber. 19 (1886), 578

Gattermann & Schulze, Ber. 30 (1897), 51

Gattermann & Liebermann, Ann. 393 (1912), 198

H₂SO₄ conc. — cherry red; on dilution — brownish red ppt.
Aqueous solution + HCl — brownish red ppt;
+ NaOH — orange yellow

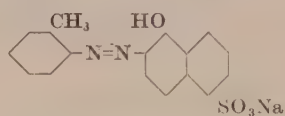
Soluble in water (yellowish red)
Very slightly soluble in ethanol

14805 C.I. Acid Brown 4 (Reddish brown)*p*-Aminoacetanilide → 1-Naphthol-5-sulfonic acid and hydrolyse the acetamido group

Discoverer — Badische Co.

FIAT 764 — Neptunbraun RX

Soluble in water (reddish brown) and ethanol (yellowish brown)
H₂SO₄ conc. — wine red + some dark blue; on dilution — reddish orange
Aqueous solution + HCl conc. — brownish orange, ppt;
+ NaOH conc. — brownish orange

14810 Acid Dye and Dye for Pigments*o*-Toluidine → 1-Naphthol-5-sulfonic acid

Discoverer — Gaess 1883

Cochineal Scarlet 2R (Sch)

Dyes wool in the presence of acid, moderately fast to light, milling and acids

Helio Red BL (IG)

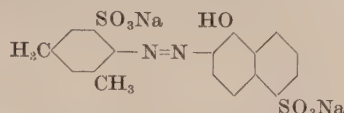
Calcium salt used as a pigment

Gaess, GP ap. G2393 (Fr. 1, 393)

Mon. sci. 14 [3] (1884), 335

Aqueous solution + HCl — flocculent red ppt; + NaOH — orange

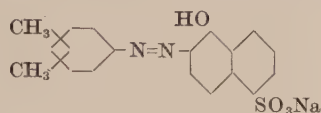
Soluble in hot water (yellowish red)
Slightly soluble in cold water
H₂SO₄ conc. — magenta red; on dilution — red flocculent ppt.

14815 Acid Dye

2-Amino-3,5-xylenesulfonic acid \rightarrow 1-Naphthol-5-sulfonic acid

Scarlet GN

For preparation of the diazo component *see* —
British Dyestuffs Corp., *USP* 1441655

14820 Acid Dye

Mixed Xylidines \rightarrow 1-Naphthol-5-sulfonic acid

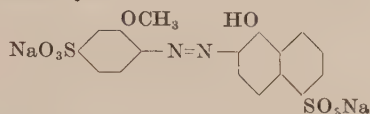
Discoverer — Gaess 1883

Sorbine Red G (By)

Dyes wool in the presence of acid, moderately fast to light and stoving

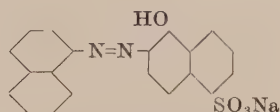
Gaess, *GP ap.* G2393 (*Fr.* 1, 393)

Soluble in water (red) and ethanol (orange red)
 H_2SO_4 conc. — wine red; on dilution — red
Aqueous solution + HCl conc. — red;
+ NaOH conc. — orange

14825 Acid Dye

3-Methoxysulfanilic acid \rightarrow 1-Naphthol-5-sulfonic acid

Discoverer — Griesheim-Elektron

Wool Red S3B (By)**14830 C.I. Acid Red 20 (Red)****14830:1 C.I. Pigment Red 54 (Bluish red, tint Pale reddish violet)**

1-Naphthylamine \rightarrow 1-Naphthol-5-sulfonic acid

Discoverers — F. Runkel and W. Herzberg 1910

Bayer Co., *BP* 932/10; *USP* 972130; *FP* 411938; *GP ap.* F28279 (*Fr.* 10, 946)

BIOS 1661, 68

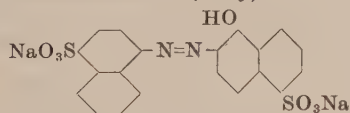
FIAT 764 — Heliobordo BL Tg. (20%)

King, *JCS* (1929), 608

Aqueous solution + HCl conc. — bluish red ppt;
+ NaOH conc. — yellower

C.I. 14830:1 is the calcium salt

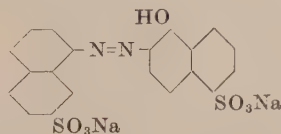
Slightly soluble in water (orange red)
 H_2SO_4 conc. — blue; on dilution — red ppt.
 HNO_3 conc. — orange brown solution

14835 C.I. Acid Red 12 (Bluish red)**C.I. Mordant Blue 78 (Navy)**

Naphthionic acid \rightarrow 1-Naphthol-5-sulfonic acid

Ciba, *GP* 66888, 67240, (*Fr.* 3, 791, 793)

Soluble in water (magenta red)
Slightly soluble in ethanol, acetone and Cellosolve
Insoluble in other organic solvents
 H_2SO_4 conc. — reddish blue; on dilution — pink solution and ppt.
 HNO_3 conc. — orange solution, turns yellow
Aqueous solution + HCl conc. — magenta red;
+ NaOH conc. — magenta red

14840 Mordant Dye

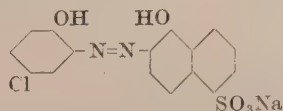
1,7-Cleve's acid \rightarrow 1-Naphthol-5-sulfonic acid

Discoverer — Bayer Co. 1903

Diamond Blue R (By)

FIAT 764 — Diamantblau R

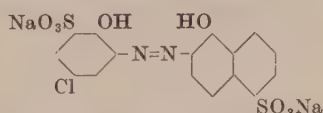
Soluble in water and ethanol (magenta red)
 H_2SO_4 conc. — reddish violet (with reddish orange, blue and magenta red); on dilution — magenta red
Aqueous solution + HCl conc. — magenta red;
+ NaOH conc. — violet

14850 Mordant Dye

2-Amino-4-chlorophenol \rightarrow 1-Naphthol-5-sulfonic acid

Discoverer — Griesheim-Elektron

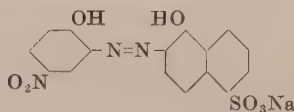
Oxochrome Violet BO (Gr E)

14855 C.I. Mordant Blue 9 (Reddish navy)

6-Amino-4-chloro-1-phenol-2-sulfonic acid
→ 1-Naphthol-5-sulfonic acid

Discoverers — M. Kahn and R. Kothe 1906
Bayer Co., BP 10420/07; USP 865252; FP 377381; GP ap.
F22525 (Fr. 9, 344)
FIAT 764 — Saeurechromblau RR

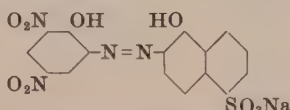
Soluble in water (violet)
Slightly soluble in ethanol
H₂SO₄ conc. — bluish violet; on dilution — pink
HNO₃ conc. — yellowish brown
Aqueous solution + HCl conc. — red;
+ NaOH conc. — magenta red

14860 C.I. Mordant Brown 92

2-Amino-4-nitrophenol → 1-Naphthol-5-sulfonic acid

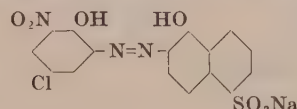
Discoverer — Bayer Co. 1906
FIAT 764 — Saeureanthracenbraun M

Soluble in water (wine red) and ethanol (red)
H₂SO₄ conc. — violet; on dilution — pink
Aqueous solution + HCl conc. — red;
+ NaOH conc. — reddish orange brown

14862 Mordant Dye

Picramic acid → 1-Naphthol-5-sulfonic acid

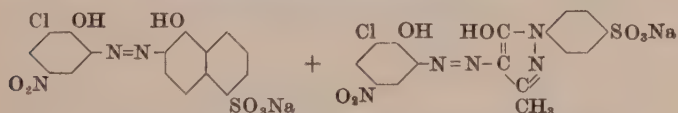
Discoverer — Agfa
Metachrome Olive (A)

14865 C.I. Mordant Black 29 (Bluish grey → Bluish black)

2-Amino-4-chloro-6-nitrophenol → 1-Naphthol-5-sulfonic acid

M.L.B., FP 328281; GP 153297 (Fr. 7, 391)
FIAT 764 — Metachromblauschwarz BBX

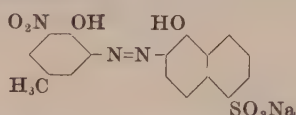
Soluble in water (reddish blue)
Moderately soluble in ethanol (reddish blue)
Slightly soluble in Cellosolve and acetone
Insoluble in other organic solvents
H₂SO₄ conc. — reddish violet; on dilution — orange (ppt.)
HNO₃ conc. — dull reddish yellow
Aqueous solution + HCl conc. — orange;
+ NaOH conc. — reddish violet

14870 C.I. Mordant Brown 15 (Reddish brown)

2-Amino-6-chloro-4-nitrophenol
→ [1-Naphthol-5-sulfonic acid (0.61 mol.)
+ 3-Methyl-1-(p-sulfophenyl)-5-pyrazolone (0.39 mol.)]

Discoverer — Bayer Co. 1916
FIAT 764 — Saeureanthracenbraun KE

Soluble in water (bordeaux)
Moderately soluble in ethanol
H₂SO₄ conc. — reddish brown; on dilution — brownish orange
ppt.
Aqueous solution + HCl conc. — brownish orange;
+ NaOH conc. — orange brown

14875 Mordant Dye

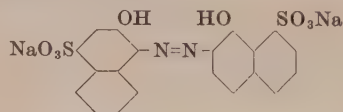
2-Amino-6-nitro-p-cresol → 1-Naphthol-5-sulfonic acid

Discoverer — Bayer Co.
Acid Chrome Blue 3RX (By)
Dyes of similar constitution —
Bayer Co., BP 9264/06; FP 365415; GP 186655 (Fr. 8, 602)

Soluble in water (blue)
Moderately soluble in ethanol (violet)
H₂SO₄ conc. — violet; on dilution — red
Aqueous solution + HCl conc. — red;
+ NaOH conc. — bordeaux

14880 C.I. Acid Blue 158 (Greenish blue)

Chromium complex derived from



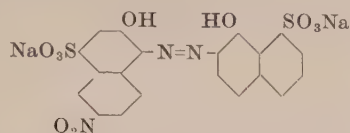
1-Amino-2-naphthol-4-sulfonic acid (sodium hydroxide and ammonium sulfate) → 1-Naphthol-8-sulfonic acid;
then heat with aqueous chromium sulfate solution containing excess sulfuric acid at 115°C for 7 hr. to form the chromium complex

Discoverer — H. Kämmerer 1926
I.G., BP 279429; FP 653701; GP 481449 (Fr. 16, 976)
BIOS 961, 70, 159
FIAT 764 — Palatinechtblau GGN

Very soluble in water (blue)
Soluble in ethanol
H₂SO₄ conc. — dark green; on dilution — blue
NaOH conc. — violet

14885 C.I. Acid Black 54 (Greenish black)

Chromium complex derived from



1-Amino-6-nitro-2-naphthol-4-sulfonic acid

→ 1-Naphthol-8-sulfonic acid;

then heat with aqueous chromium formate at 125°C to form the chromium complex

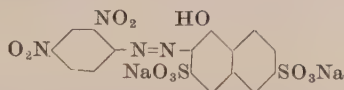
FIAT 764 — Palatinechtschwarz GGN

Soluble in water (blackish blue)

H₂SO₄ conc. — blackish violet; on dilution — blackish violet ppt.

Aqueous solution + HCl — violet ppt;

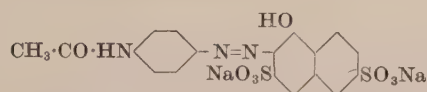
+ NaOH — reddish violet

14890 Acid Dye

2,4-Dinitroaniline → 1-Naphthol-3,6-disulfonic acid

Nitrazol Yellow (IG)Used only as an indicator (pH range 5.5–8), especially in
Delta Paper

FIAT 1313, 3, 370

14895 C.I. Acid Red 7 (Bluish red)*p*-Aminoacetanilide → 1-Naphthol-3,6-disulfonic acidAqueous solution + HCl conc. — red;
+ NaOH conc. — orange brown

Discoverer — M. Kahn 1897

FIAT 764 — Azogrenadin S

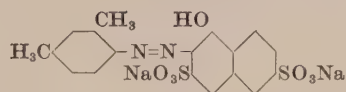
JSDC, 13 (1897), 170

Cross, JSDC, 61 (1945), 76

Soluble in water (bluish red)

Moderately soluble in ethanol and acetone

Insoluble in toluene

H₂SO₄ conc. — red; on dilution — bright redHNO₃ conc. — yellowish orange**14900 C.I. Acid Red 8 (Bright yellowish red)**

2,4-Xyldine → 1-Naphthol-3,6-disulfonic acid

Aqueous solution + HCl conc. — magenta red;
+ NaOH conc. — weak brownish yellow

Discoverers — O. Gürke and C. Rudolph 1886

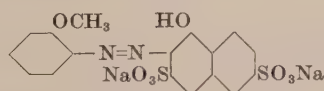
Gürke & Rudolph, BP 15716/85; FP 173007; GP 38281, GP ap.
G3636, (Fr. 1, 385, 386)

FIAT 764 — Cochenillescharlach PS

Soluble in water (magenta red)

Slightly soluble in ethanol (orange)

Very slightly soluble in acetone

H₂SO₄ conc. — magenta red; on dilution — pink**14905 C.I. Acid Red 5 (Red)***o*-Anisidine → 1-Naphthol-3,6-disulfonic acidAqueous solution + HCl conc. — magenta red;
+ NaOH conc. — brownish orange

Discoverer — Agfa

For dyes of similar constitution —

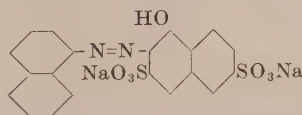
Gürke & Rudolph, BP 15716/85; FP 173007; GP 38281, GP ap.
G3636 (Fr. 1, 385, 386)

FIAT 764 — Guineaechtrot RR

Soluble in water (red to magenta red)

Slightly soluble in ethanol (red) and acetone

Insoluble in other organic solvents

H₂SO₄ conc. — violet; on dilution — magenta red**14910 C.I. Acid Red 3 (Bluish red)**

1-Naphthylamine → 1-Naphthol-3,6-disulfonic acid

Discoverers — O. Gürke and C. Rudolph

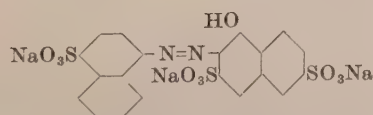
Gürke & Rudolph, BP 15716/85; FP 173007; GP 38281, GP ap.
G3636, (Fr. 1, 385, 386)

Very soluble in water (magenta red) and ethanol (red)

H₂SO₄ conc. — blue; on dilution — reddish violet

Aqueous solution + HCl conc. — bordeaux ppt;

+ NaOH conc. — orange brown

14915 Acid Dye

Naphthionic acid → 1-Naphthol-3,6-disulfonic acid

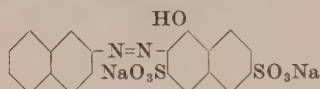
This information is repeated from C.I. (1st edition) No. 181
where the constitution is ascribed to **Azo Red A (C)**. It now
appears that the correct constitution of Azo Red A (C) is that of
C.I.14910

Soluble in water (red)

H₂SO₄ conc. — blue; on dilution — violet solution, then red ppt.

Aqueous solution + HCl — unaltered;

+ NaOH — yellower

14920 C.I. Acid Red 16 (Red)

2-Naphthylamine → 1-Naphthol-3,6-disulfonic acid

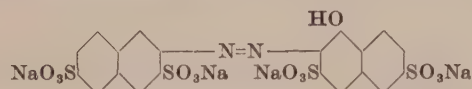
Aqueous solution + HCl conc. — red;
+ NaOH conc. — orange brown

Discoverers — O. Gürke and C. Rudolph 1885

Gürke & Rudolph, *BP* 15716/85; *FP* 173007; *GP* 38281, *GP ap.* G3636, (*Fr.* 1, 385, 386)

FIAT 764 — Brillantwollscharlach P5R

Soluble in water (red);
Moderately soluble in ethanol (orange red)
 H_2SO_4 conc. — dark violet; on dilution — red

14925 Dye for Pigments

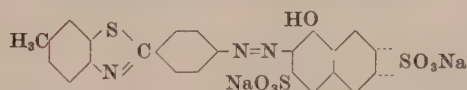
3-Amino-2,7-naphthalenedisulfonic acid
→ 1-Naphthol-3,6-disulfonic acid

Helio Purpurine 4BL (By)

Aluminium and barium salts were used as pigments for printing inks and writing inks respectively

Färberztg., 15 (1904), 95

Chem. Tr. J. 33 (1905), 116

14930 C.I. Direct Red 48 (Bright bluish pink)

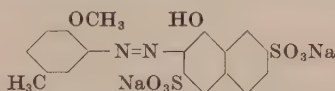
Dehydrothio-*p*-toluidine → 1-Naphthol-3,6(and 3,7)-disulfonic acids

Bayer Co., *BP* 4756/93; *FP* 228125; *GP* 73349 (*Fr.* 3, 759)

FIAT 764 — Geranin G

JSDC, 8 (1892), 90

Soluble in water (pink)
Moderately soluble in ethanol (red)
 H_2SO_4 conc. — reddish violet; on dilution — orange red
Aqueous solution + HCl conc. — orange brown;
+ NaOH conc. — reddish brown ppt.

14940 C.I. Acid Red 22 (Red)

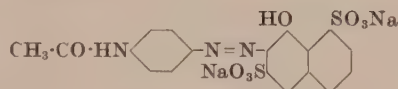
Cresidine → 1-Naphthol-3,7-disulfonic acid

Discoverer — Cassella Co.

BIOS 1548, 59

FIAT 764 — Brillantlanafuchsin SL

Soluble in water (magenta red)
Moderately soluble in ethanol (red)
 H_2SO_4 conc. — deep violet; on dilution — magenta red
Aqueous solution + HCl conc. — magenta red;
+ NaOH conc. — orange brown

14950 Acid Dye

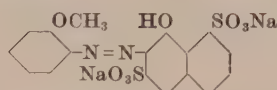
p-Aminoacetanilide → 1-Naphthol-3,8-disulfonic acid

Discoverer — Agfa 1896

Heumann, *Die Anilinfarben*, 4 (1906), 1382

FIAT 764 — Guinearot 4R

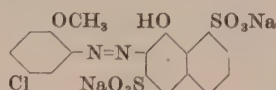
Soluble in water (orange red)
Aqueous solution + HCl — brown ppt.
 H_3SO_4 conc. — red; on dilution — brown ppt.

14955 Acid Dye

o-Anisidine → 1-Naphthol-3,8-disulfonic acid

Eosamine G (IG)

Dyes wool in the presence of sulfuric acid. Levelling, good
Fastness Properties (C): Light 5, Milling (alkaline) 1,
Perspiration 2, Washing 2
FIAT 764 — Ensamin G (error for Eosamin G)

14960 Acid Dye

5-Chloro-*o*-anisidine → 1-Naphthol-3,8-disulfonic acid

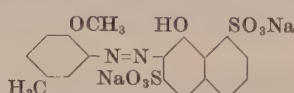
Discoverer — Bayer Co.

Fast Ponceau L (By)

For dyes of similar constitution —

Agfa, *BP* 4625/88, 5910/88; *USP* 405938; *FP* 189712; *GP* 45776
(*Fr.* 2, 253)

Soluble in water (red)
Very slightly soluble in ethanol (weak reddish brown)
 H_2SO_4 conc. — deep blue; on dilution — red

14965 C.I. Acid Red 21 (Bright red) is similar (14965:1)

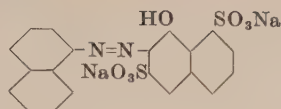
Cresidine → 1-Naphthol-3,8-disulfonic acid

Discoverer — G. Schultz 1894

JSDC, 11 (1895), 76

Erdmann, *Chem. Ind.* 19 (1896), 8

Soluble in water (bluish red)
 H_2SO_4 conc. — violet blue; on dilution — bluish red
Aqueous solution + HCl — unaltered;
+ NaOH — yellower

14970 Acid Dye

1-Naphthylamine → 1-Naphthol-3,8-disulfonic acid

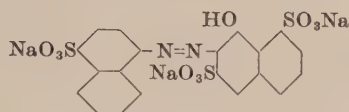
Discoverer — M. Andresen 1897

Brilliant Bordeaux S (A)

Agfa, *BP* 4625/88, 5910/88; *USP* 405938; *FP* 189712; *GP* 45776 (*Fr.* 2, 253)

FIAT 764 — Brillantbordo S

Soluble in water
Slightly soluble in ethanol (magenta red)
 H_2SO_4 conc. — deep blue; on dilution — magenta red
Aqueous solution + HCl conc. — magenta red;
+ NaOH conc. — reddish brown

14975 Acid Dye

Naphthionic acid → 1-Naphthol-3,8-disulfonic acid

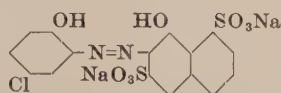
Azo Rubine SG (A) (By)

Agfa, *BP* 4625/88; *USP* 405938; *FP* 189712; *GP* 45776 (*Fr.* 2, 253)

Soluble in water (red)
Slightly soluble in ethanol (pale reddish brown)
 H_2SO_4 conc. — deep violet; on dilution — pink
Aqueous solution + HCl conc. — red;
+ NaOH conc. — reddish orange brown

14980 Acid Dye

Chromium complex derived from

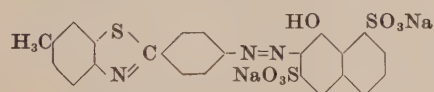


Treat C.I.14960 with chromium formate and dry the isolated product in the presence of chromium formate

Palatine Fast Blue 3959 (IG)

BIOS 961, 71

FIAT 764 — Palatinechtblau 3959

14985 C.I. Direct Red 47 (Bluish pink)

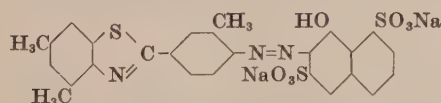
Dehydrothio-*p*-toluidine → 1-Naphthol-3,8-disulfonic acid

Discoverer — G. Schultz 1888

Agfa, *BP* 17333/88; *USP* 418657; *FP* 194406; *GP* 63951 (*Fr.* 3, 762)

FIAT 764 — Erika GGN

Soluble in water (pink to red)
Moderately soluble in ethanol
 H_2SO_4 conc. — reddish violet; on dilution — dullish orange red
Aqueous solution + HCl conc. — scarlet ppt;
+ NaOH conc. — corinth ppt.

14990 C.I. Direct Red 51 (Bluish pink)

2-(4-Amino-*m*-tolyl)-4,6-dimethylbenzothiazole
→ 1-Naphthol-3,8-disulfonic acid

Discoverer — G. Schultz 1888

Agfa, *BP* 17333/88; *USP* 418657; *FP* 194406; *GP* 63951 (*Fr.* 3, 762)

FIAT 764 — Erika BN

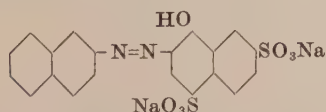
Anschütz & Schultz, *Ber.* 22 (1889), 583

Paul, *Z. angew. Chem.* 9 (1896), 680

Knecht, *JSDC*, 21 (1905), 5

Soluble in water (pink)
Moderately soluble in ethanol (red)
 H_2SO_4 conc. — reddish violet; on dilution — scarlet

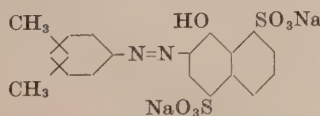
Aqueous solution + HCl conc. — red ppt;
+ NaOH conc. — violet ppt.

15000 Acid Dye

2-Naphthylamine → 1-Naphthol-4,7-disulfonic acid

Wool Red (Gr E)

Oehler Co., *GP* 74744 (*Fr.* 3, 425)

15010 Acid Dye

Mixed Xylidines → 1-Naphthol-4,8-disulfonic acid

Discoverers — H. Vollbrecht and C. Mensching 1885

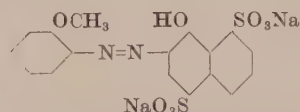
Wool Scarlet R (Sch)

Dyes wool in the presence of acid, moderately fast to light, washing and milling

Schoellkopf, Hartford & Hanna Co., *BP* 15775-82/85
USP 333034-42; *FP* 173083-4; *GP* 40571, 42304, (*Fr.* 1, 393, 396)

Soluble in water (yellowish red)
Very slightly soluble in ethanol
 H_2SO_4 conc. — cherry red; on dilution — red

Aqueous solution + HCl — bluish red;
+ NaOH — yellowish red

15015 Acid Dye

o-Anisidine → 1-Naphthol-4,8-disulfonic acid

Aqueous solution + HCl conc. — red;
+ NaOH conc. — yellower red

Discoverer — C. Duisberg 1892

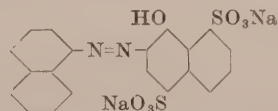
Azo Cochineal (By)

Dyes wool in the presence of acid, moderately fast to light and of good fastness to acids, alkalis and stoving

Patents as for C.I.15010

JSDC, **8** (1892), 74

Very soluble in water (red)
Slightly soluble in ethanol (pink)
H₂SO₄ conc. — red; on dilution — pink

15020 Acid Dye

1-Naphthylamine → 1-Naphthol-4,8-disulfonic acid

Discoverers — H. Vollbrecht and C. Mensching 1884

Buffalo Rubine (Sch), Azo Bordeaux (By)

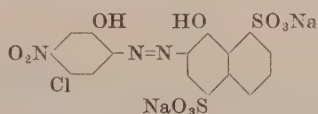
Dyes wool in the presence of acid, moderately fast to light, but not fast to milling

Patents as for C.I.15010

Soluble in water (magenta red)
H₂SO₄ conc. — blue; on dilution — magenta red
Aqueous solution + HCl — unaltered (or a red violet soluble ppt.);
+ NaOH conc. — unaltered (or a red soluble ppt.)

15025 C.I. Acid Blue 169 (Blue)

A chromium complex derived from



5-Chloro-4-nitro-*o*-anisidine → 1-Naphthol-4,8-disulfonic acid;
then heat with aqueous chromium sulfate at 125°–135°C to form the chromium complex

During the chroming process the methoxy group is replaced by hydroxy and 20% of the -SO₃Na group in position 4 is removed

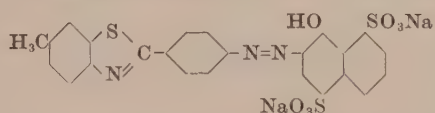
Discoverers — F. Lange and H. Krzikalla 1932

I.G., *BP* 395968; *USP* 1978880; *FP* 638772; *GP* 584645, (*Fr.* **20**, 1165)

BP 443722; *USP* 2111270; *FP* 792554; *GP* 650559, 658363, (*Fr.* **24**, 670, 675)

BIOS 961, 72

FIAT 764 — Palatinecht dunkelblau GN

15030 Direct Dye (Bluish pink)

Dehydrothio-*p*-toluidine → 1-Naphthol-4,8-disulfonic acid

Geranine BB (By)

Fastness Properties (C): Acid (organic) 3, Alkali 3,
Hot pressing 3, Light 2, Washing 1, Water 1–2

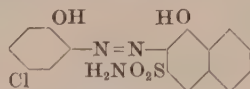
Bayer Co., *BP* 4756/93; *FP* 228125; *GP* 73349 (*Fr.* **3**, 759)

JSDC, **8** (1892), 90

Moderately soluble in water (pink)
Slightly soluble in ethanol
H₂SO₄ conc. — reddish violet; on dilution — orange red
Aqueous solution + HCl conc. — red ppt;
+ NaOH conc. — reddish violet ppt.

15045 Acid Dye

A chromium complex derived from



2-Amino-4-chlorophenol → 1-Naphthol-3-sulfonamide;
then form the chromium complex containing 1 atom of chromium to 2 mol. monoazo dye

Discoverer — I.G.

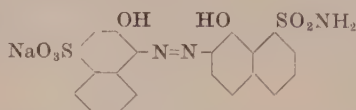
Perlon Fast Dark Blue RS (IG)

For dyeing of "Perlon"

BIOS Misc. **20**, **29** — Perlon Fast Dark Blue RS

15050 C.I. Acid Blue 158:1 (Greenish blue)

A chromium complex derived from



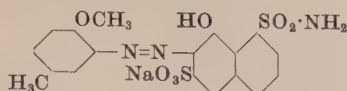
1-Amino-2-naphthol-4-sulfonic acid
→ 1-Naphthol-8-sulfonamide

Discoverers — F. Straub and H. Schneider 1922

Ciba, *BP* 207162; *USP* 1488411; *FP* 570995; *GP* 411384 (*Fr.* **15**, 497)

Venkataraman, 538

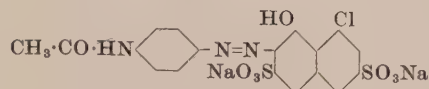
Soluble in water (greenish blue)
H₂SO₄ conc. — green; on dilution — blue
Aqueous solution + HCl — blue solution and ppt;
+ NaOH — violet

15060 Acid Dye

Cresidine → 8-Sulfamoyl-1-naphthol-3-sulfonic acid

Guinea Carmine B (A)

FIAT 764 — Guineacarmine B

15070 Acid Dye

p-Aminoacetanilide → 8-Chloro-1-naphthol-3,6-disulfonic acid

Discoverer — Cassella Co. 1897

Lanafuchsin SB (C)

FIAT 764 — Lanafuchsin SB

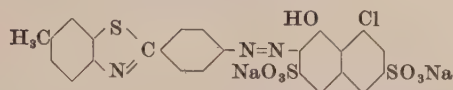
Soluble in water (orange red)

Slightly soluble in ethanol (reddish violet)

H₂SO₄ conc. — magenta red; on dilution — magenta red

HNO₃ conc. — dull reddish orange

Aqueous solution + HCl conc. — magenta red;
+ NaOH conc. — brownish orange

15075 C.I. Direct Red 20 (Bluish pink)

Dehydrothio-p-toluidine → 8-Chloro-1-naphthol-3,6-disulfonic acid

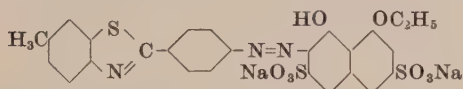
Aqueous solution + HCl conc. — magenta red;
+ NaOH conc. — bordeaux

Discoverer — A. Weinberg 1893

Cassella Co., BP 1920/84, 9441/84; USP 535037; FP 235271;
GP 79055 (Fr. 4, 526)

Bayer Co., FP 228126; GP 96768 (Fr. 4, 845)

FIAT 764 — Diaminrosa M ex.

15080 C.I. Direct Red 3 (Bluish pink)

Dehydrothio-p-toluidine
→ 8-Ethoxy-1-naphthol-3,6-disulfonic acid

Discoverers — J. Bammann and M. Ulrich 1893

Bayer Co., BP 3495/93; USP 524005; FP 228125; GP 73251
(Fr. 3, 761)

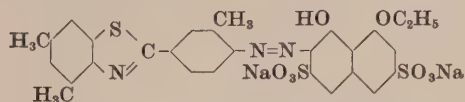
FIAT 764 — Brillantgeranin B

Soluble in water (magenta red)

Moderately soluble in ethanol

H₂SO₄ conc. — blue; on dilution — pale orange

Aqueous solution + HCl conc. — orange;
+ NaOH conc. — reddish violet

15085 Direct Dye

2-(4-Amino-m-tolyl)-4,6-dimethylbenzothiazole
→ 8-Ethoxy-1-naphthol-3,6-disulfonic acid

Discoverers — J. Bammann and M. Ulrich 1893

Brilliant Geranine 3B (By)

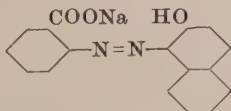
Bayer Co., BP 3495/93; USP 524005; FP 228125; GP 73251
(Fr. 3, 761)

Soluble in water (magenta red)

Moderately soluble in ethanol

H₂SO₄ conc. — blue; on dilution — pink

Aqueous solution + HCl conc. — orange ppt;
+ NaOH conc. — wine red

15500 C.I. Pigment Red 50 (Reddish orange, tint Bluish pink)***15500:1 C.I. Pigment Red 50:1****15500:2 C.I. Pigment Red 50:2**

Anthranilic acid → 2-Naphthol

C.I. 15500:1 is the barium salt

C.I. 15500:2 is the calcium salt

Discoverer — K. König 1905

M.L.B., BP 22781/06; USP 878964; FP 373115; GP 189023
(Fr. 9, 424)

Drew & Landquist, JCS, (1938), 295

Drew & Fairbairn, JCS, (1939), 829

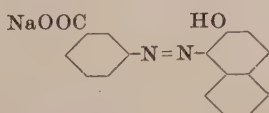
Beech & Drew, JCS, (1940), 604, 609

Drew & Dunton, JCS, (1940), 1065

Slightly soluble in water on boiling (orange) and in ethanol
m.p. (from glacial acetic acid) 276°C

H₂SO₄ conc. — crimson; on dilution — orange ppt.

Aqueous solution + HCl — orange ppt;
+ NaOH — darker orange

15505 Mordant Dye

m-Aminobenzoic acid → 2-Naphthol

Discoverers — P. Griess 1881; K. Krekeler and R. Lauch 1890

Diamond Orange N Paste (By)

An afterchrome dye

Griess, Ber. 14 (1881), 2035

Free acid—

M.p. 242–243°C — red needles from glacial acetic acid

Insoluble in cold, soluble in hot alcohol

H₂SO₄ conc. — intense reddish yellow or (in thin layers) violet red

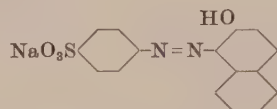
15510 C.I. Acid Orange 7 (Bright reddish orange)

15510:1 C.I. Pigment Orange 17

15510:2 C.I. Pigment Orange 17:1

15510:3 C.I. Solvent Orange 49

Classical name **Orange II**



Sulfanilic acid → 2-Naphthol

C.I. 15510:1 is the Barium salt

C.I. 15510:2 is the Aluminium salt

C.I. 15510:3 is an amine condensate

Soluble in water (reddish yellow) and in ethanol (orange)

H₂SO₄ conc. — magenta red; on dilution — brownish yellow ppt.

Aqueous solution + HCl — brownish yellow ppt;

+ NaOH — dark brown

Discoverer — Z. Roussin 1876

BIOS 961, 44

FIAT 764 — Orange II "F"

Hofmann, *Ber.* **10** (1877), 1378

Griess, *Ber.* **11** (1878), 2198

von Miller, *Ber.* **13** (1880), 268

Witt, *Chem. Zeit.* **4** (1880), 437

Mühlhäuser, *Dingl.* **264** (1887), 181

Grandmougin & Michel, *Ber.* **25** (1892), 981

Knecht and Hibbert, *Ber.* **36** (1903), 1553

Knecht, *JSDC*, **19** (1903), 171

Grandmougin, *Ber.* **39** (1906), 2495

Grandmougin, *J. prakt. Chem.* **76** (1907), 129

Ruggli & Fischli, *Helv. Chem. Acta*, **7** (1924), 496

Whitehead, *Chem. Tr. J.* **77** (1925), 33

Bucherer & Stickel, *J. prakt. Chem.* **110** (1925), 309

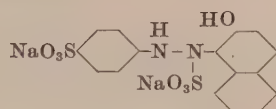
Seyewetz & Chaix, *Bull. Soc. chim.*, **41** (1927), 332

Keyworth, *JSDC*, **43** (1927), 349

King, *JCS*, **132** (1927), 2639

Bucherer & Rauch, *J. prakt. Chem.* **132** (1931), 227

15511 Direct Dye



Treat C.I.15510 with sodium bisulfite

Discoverer — Prud'homme 1879

Narceine (DH)

Formerly used in calico printing

Nolting, *Mon. sci.* **16** [3] (1866), 319

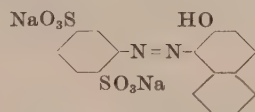
Soluble in water (yellow)

H₂SO₄ conc.—yellowish brown; on dilution (and warming) — evolution of sulfur dioxide

Aqueous solution + HCl conc.—unaltered;

+ NaOH conc.—brownish red

15515 Acid Dye



2-Amino-*p*-benzenedisulfonic acid → 2-Naphthol

Discoverer — Bayer Co.

Film Orange P (By)

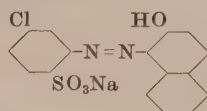
Soluble in water, slightly soluble in ethanol (golden orange)

H₂SO₄ conc. — reddish violet; on dilution — golden orange

Aqueous solution + HCl conc. — golden orange;

+ NaOH conc. — reddish orange brown

15520 Dye for Pigments



2-Amino-4-chlorobenzenesulfonic acid → 2-Naphthol

Permanent Orange R (A)

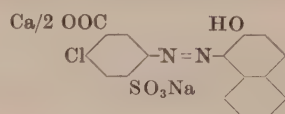
Agfa, *FP* 354676; *GP* 186257 (*Fr.* **8**, 705)

Insoluble in water

H₂SO₄ conc. — bluish red; on dilution — reddish brown

NaOH — reddish brown

15525 C.I. Pigment Red 68 (Bright yellowish red)



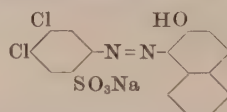
5-Amino-2-chloro-4-sulfobenzoic acid → 2-Naphthol

BIOS 1548, 209

FIAT 764 — Permanentrottoner NCR Plv.

FIAT 1313, 3, 490

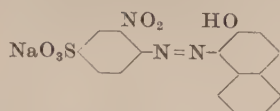
15530 C.I. Pigment Orange 7 (Bright reddish orange)



2-Amino-4,5-dichlorobenzenesulfonic acid → 2-Naphthol

BIOS 961, 39. BIOS 1548, 211

FIAT 764 — Litholrot 3G Plv.

15540 C.I. Acid Orange 23 (Bright reddish orange)

3-Nitrosulfanilic acid → 2-Naphthol

Fast Orange O (MLB)

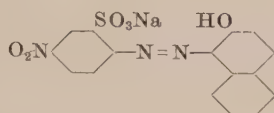
Discoverer — O. Ernst 1901

M.L.B., BP 16409/01; USP 714883; FP 313598; GP 129539

(Fr. 6, 1039)

BIOS 961, 26

Soluble in hot water (orange)

15550 Pigment (Yellowish red)*

2-Amino-5-nitrobenzenesulfonic acid → 2-Naphthol

* Barium salt

Discoverer — O. Ernst 1901

Lake Red P (MLB)

Pigment for paints and printing inks

M.L.B., BP 16409/01; USP 714882; FP 313598; GP 128456

(Fr. 6, 1038)

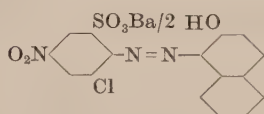
FIAT 764 — Lackrot P Plv.

Slightly soluble in hot water (orange red)

H₂SO₄ conc. — cherry red; on dilution — red ppt.

Aqueous solution + HCl — bluish red ppt;

+ NaOH — bluish black

15555 Pigment

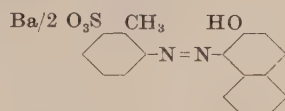
2-Amino-3-chloro-5-nitrobenzenesulfonic acid → 2-Naphthol;

and convert to the barium salt

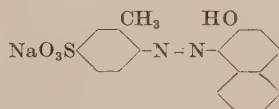
Pigment Lake Red LP (IG)

BIOS 1548, 210

Note — BIOS 1661, 150 states a different constitution for Pigment Lake Red LP (IG)

15570 C.I. Pigment Red 99

3-Amino-o-toluenesulfonic acid → 2-Naphthol

15575 C.I. Acid Orange 8 (Bright reddish orange)

4-Amino-m-toluenesulfonic acid → 2-Naphthol

BIOS 961, 45

FIAT 764 — Orange ROF

Mühlhäuser, Dingl. 264 (1887), 244

Very soluble in water (reddish orange) and Cellosolve

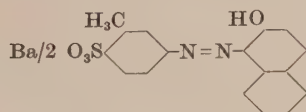
Slightly soluble in ethanol and acetone

Insoluble in other organic solvents

H₂SO₄ conc. — bluish red; on dilution — yellowish orange solution and ppt.HNO₃ conc. — wine coloured solution, turns orange

Aqueous solution + HCl conc. — cerise;

+ NaOH — brownish ppt.

15580 C.I. Pigment Red 51 (Yellowish red, tint Pink)

4-Amino-o-toluenesulfonic acid → 2-Naphthol;

and convert to the barium salt

Discoverer — E. Meckbach 1920

Bayer Co., GP 366168 (Fr. 14, 1045)

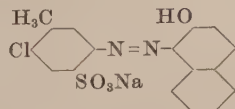
BIOS 1661, 84

FIAT 764 — Heliorot RMT ex. Plv.

Barium salt

H₂SO₄ conc. — claret; on dilution — scarlet ppt.HNO₃ conc. — dull red solution

NaOH conc. — dull red solution

15585 C.I. Pigment Red 53 (Bright reddish orange)**15585:1 C.I. Pigment Red 53:1****15585:2 C.I. Pigment Red 53:2**

2-Amino-5-chloro-p-toluenesulfonic acid → 2-Naphthol

Discoverer — K. Schirmacher 1902

M.L.B., BP 23831/02; USP 733280; FP 328131; GP 145908

(Fr. 7, 467)

BIOS 1661, 87

FIAT 764 — Lackrot C Plv.

FIAT 1313, 2, 282 — Vulcan Lake Red C

BIOS 986, 130 — preparation of the diazo component

Whitmore & Revukas, JACS, 62 (1940), 1687

Alcoholic KOH — dark brownish red

Aqueous solution + HCl — red ppt;

+ NaOH conc. — brick red ppt.

C.I. 15585:1 is the barium salt

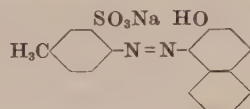
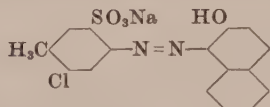
C.I. 15585:2 is the calcium salt

H₂SO₄ conc. — cherry red; on dilution — brownish red ppt.

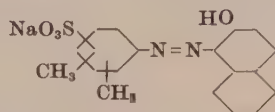
NaOH (10%) — slightly soluble hot (yellow)

Slightly soluble in water and ethanol

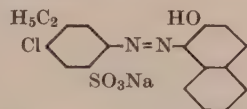
Insoluble in acetone and benzene

15590 C.I. Pigment Red 706-Amino-*m*-toluenesulfonic acid → 2-Naphthol**Brilliant Lake Scarlet YBL, YL (JWL)**For preparation of the diazo component see —
FIAT 1313, 1, 51**15595 C.I. Pigment Red 69 (Bright yellowish red)**6-Amino-4-chloro-*m*-toluenesulfonic acid → 2-Naphthol*Discoverers* — P. Julius and S. Haeckel 1904
Badische Co., *USP* 759716; *GP* 175378 (*Fr.* 8, 712)
BIOS 961, 39
FIAT 764 — Litholrot GG Plv.

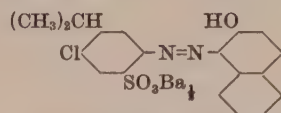
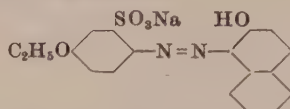
Difficultly soluble in hot water; the calcium, barium, aluminium and lead salts are water-insoluble

15600 Acid Dye

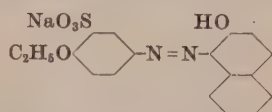
Aminoxylenesulfonic acid → 2-Naphthol

Discoverer — Badische Co. 1877**Orange R (LDC)**Dyes wool in the presence of acid. Also used for dyeing silk and for the manufacture of lakes
Mühlhäuser, *Dingl.* 264 (1887), 181, 242Soluble in water (orange yellow)
 H_2SO_4 conc. — cherry red; on dilution — brown ppt.
Aqueous solution + HCl — brownish red ppt;
+ NaOH — brownish yellow**15602 C.I. Pigment Orange 46 (Bright reddish orange)**

2-Amino-5-chloro-4-ethylbenzenesulfonic acid → 2-Naphthol

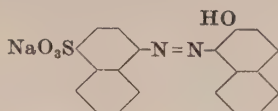
USP 2598483**15603 C.I. Pigment Red 117 (Bright yellowish red)**2-Amino-5-chloro-*p*-cumenesulfonic acid → 2-Naphthol;
then convert to the barium salt*Discoverers* — T. E. Ludwig and O. E. Knapp 1957
Sherwin-Williams *USP* 2796415**15610 Dye for Pigments**

2-Amino-5-ethoxybenzenesulfonic acid → 2-Naphthol

Permanent Red 6B (A)Barium salt used as pigment for printing inks and paints
Fastness Properties: Light good; Linseed oil, very good
Agfa, *FP* 329037; *GP* 146655 (*Fr.* 7, 452)
BIOS 1548, 212. *BIOS* 1661, 126
FIAT 764 — Permanentrot 6B Tg. 30% H_2SO_4 conc. — carmine red**15615 Dye for Pigments**

6-Ethoxymetanilic acid → 2-Naphthol

Discoverer — Bayer Co. 1910**Helio Bordeaux 6BL (By)***BIOS* 1661, 70Soluble in water (reddish violet)
Slightly soluble in ethanol
 H_2SO_4 conc. — dark greenish blue; on dilution — reddish violet
Aqueous solution + HCl — bluer;
+ NaOH conc. — bluish violet

15620 C.I. Acid Red 88 (Red)

Naphthionic acid → 2-Naphthol

Discoverers — H. Caro and Z. Roussin 1877

Badische Co., BP 786/78; USP 204799; FP 123148; GP 5411 (Fr. 1, 358)

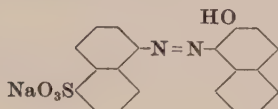
Griess, *Ber.* 11 (1878), 2199King, *JCS*, 132 (1927), 2639Drew & Landquist, *JCS* (1938), 298Cross, *JSDC*, 61 (1945), 75

Soluble in water, ethanol and Cellosolve (red)

Slightly soluble in acetone

H₂SO₄ conc. — bluish violet; on dilution — yellowish brown ppt.HNO₃ conc. — slightly soluble (reddish yellow)

NaOH dil. — reddish brown solution, dark ppt.

15625 C.I. Acid Red 141 (Red)

5-Amino-1-naphthalenesulfonic acid → 2-Naphthol

Discoverer — H. Caro 1877

Badische Co., BP 786/78; USP 204799; FP 123148; GP 5411 (Fr. 1, 358)

E. Kohner, *J. prakt. Chem.* 61 (1900), 228

Soluble in hot water (red)

Slightly soluble in cold water and ethanol

H₂SO₄ conc. — reddish violet; on dilution — brown ppt.HNO₃ conc. — yellowish brown solution

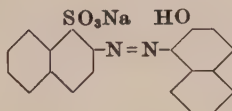
NaOH dil. — yellowish brown solution

Aqueous solution + HCl — brown ppt;

+ NaOH — yellower

15630 C.I. Pigment Red 49 (Yellowish red, tint Yellowish pink)**15630:1** C.I. Pigment Red 49:1**15630:2** C.I. Pigment Red 49:2**15630:3** C.I. Pigment Red 49:3

Classical name — Lithol Red



Tobias acid → 2-Naphthol

C.I. 15630:1 is the barium salt

C.I. 15630:2 is the calcium salt

C.I. 15630:3 is the strontium salt

Discoverer — P. Julius 1899

Badische Co., BP 25511/99; USP 650757; FP 297330; GP 112833 (Fr. 6, 1032)

Wülfing, Dahl Co., BP 4859/09

BIOS 1661, 101

FIAT 764 — Litholrot R Plv.

Morgan, *JSDC*, 37 (1921), 50

Slightly soluble in hot water and ethanol

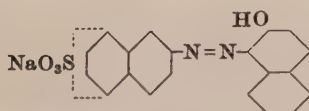
Slightly soluble in acetone

H₂SO₄ conc. — reddish violet; on dilution — redder violet then reddish brown ppt.HNO₃ — brownish red solution

NaOH — slightly soluble

Alcoholic solution + HCl — brownish violet;

+ NaOH — unaltered

15635 C.I. Acid Red 9 (Yellowish red)

6(and 7)-Amino-1-naphthalenesulfonic acids → 2-Naphthol

Discoverers — Durand and Huguenin

Badische Co., USP 690294; GP 20760 (Fr. 1, 419)

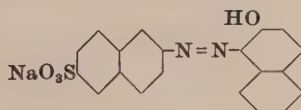
Dahl Co., BP 7712/84, 7713/84; GP 29084 (Fr. 1, 421)

Slightly soluble in cold water, soluble hot (yellowish red)

H₂SO₄ conc. — magenta red; on dilution — brown ppt.

Aqueous solution + HCl — brown ppt;

+ NaOH — browner

15640 C.I. Acid Red 10 (Yellowish red)

Broenner's acid → 2-Naphthol

Discoverer — H. Prinz 1882

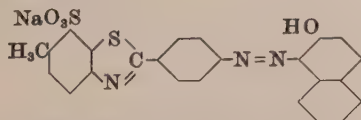
Farbenfab. von Brönnner, BP 3724/82; USP 332829; FP 150503; GP 22547 (Fr. 1, 414)

Soluble in water (scarlet)

H₂SO₄ conc. — magenta red; on dilution — brownish red ppt.

Aqueous solution + HCl — brown ppt;

+ NaOH — reddish brown ppt.

15660 Direct DyeDehydrothio-*p*-toluidinesulfonic acid* → 2-Naphthol

* or Primuline (C.I.49000) may be used as diazo component

Discoverers — A. G. Green 1887, C. Dreyfus 1889

Clayton Aniline, BP 18901/89; USP 441945; GP 51331 (Fr. 2, 294). BP 9280/88; USP 404097; GP ap. C.2643 (Fr. 2, 295)

(bisulfite compound)

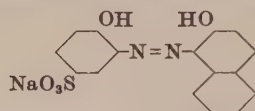
Green, *JSDC*, 6 (1890), 32

Soluble in water (orange brown) and ethanol (reddish orange)

H₂SO₄ conc. — violet; on dilution — orange red

Aqueous solution + HCl conc. — yellowish brown, ppt;

+ NaOH conc. — orange brown ppt.

15670 C.I. Mordant Violet 5 (Dull reddish violet)

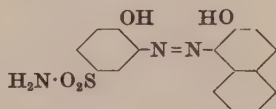
2-Amino-1-phenol-4-sulfonic acid → 2-Naphthol

Discoverers — E. Erdmann and O. Borgmann 1893
 Erdmann & Borgmann, *GP* 78409 (*Fr.* 4, 785)
FIAT 764 — Saeurealizarinviolett N
 King, *JCS* (1932), 1272
 Drew & Fairbairn, *JCS* (1939), 827
 Beech & Drew, *JCS* (1940), 604, 608
 Drew & Dunton, *JCS* (1940), 1066

Soluble in water (magenta red) and ethanol (reddish orange)
 Slightly soluble in acetone
 H_2SO_4 conc. — reddish violet; on dilution — orange
 HNO_3 conc. — yellowish brown
 Aqueous solution + HCl conc. — orange;
 + NaOH conc. — brownish orange

15675 C.I. Acid Red 296 (Bluish pink)
C.I. Solvent Red 102 (Bluish red)

A chromium complex derived from



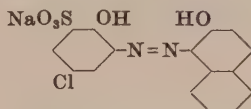
2-Amino-1-phenol-4-sulfonamide → 2-Naphthol;
 then convert to the chromium complex containing 1 atom of chromium to
 2 mol. monoazo dye

BIOS 961, 95
BIOS MISC 20, 31 and appendix 38

For preparation of similar dyes and of the diazo component *see* —
 Ciba, *USP* 1325841

15680 Acid and Solvent Dye

A chromium complex derived from



6-Amino-4-chloro-1-phenol-2-sulfonic acid → 2-Naphthol;
 then heat with chromium formate in aqueous solution for 4 hr. at 130°C
 to form the chromium complex containing 1 atom of chromium to 1 mol. of
 monoazo dye

Palatine Fast Blue 1106 (IG)

Used as a basis for Palatine Fast Navy Blues

Zapon Fast Violet R (IG)

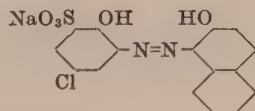
Dye for alcoholic solvents

FIAT 764 — Palatinechtblau 1106
FIAT 1313, 3, 135 — Zapon Fast Violet R
 Race, Rowe & Speakman, *JSDC*, 62 (1946), 372

Moderately soluble in water (orange red)
 Soluble in ethanol
 H_2SO_4 conc. — violet
 HNO_3 conc. — brownish yellow
 HCl conc. — red suspension
 NaOH dil. — bluish brown suspension, slightly soluble

15681 C.I. Acid Violet 91 (Violet)

A 2:1 cobalt complex of

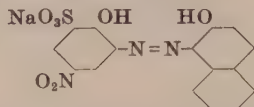


6-Amino-4-chloro-1-phenol-2-sulfonic acid → 2-Naphthol;
 then convert to the cobalt complex

Soluble in water (bluish red)
 Moderately soluble in ethanol (reddish violet)
 H_2SO_4 conc. — reddish violet; on dilution — dull orange
 Aqueous solution + HCl — bluish red;
 + NaOH — reddish violet

15685 C.I. Acid Red 184 (Bordeaux)

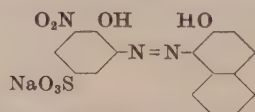
A chromium complex of the monoazo dye



6-Amino-4-nitro-1-phenol-2-sulfonic acid → 2-Naphthol;
 then heat with chromium formate in aqueous solution for $\frac{1}{2}$ –1½ hr. at 130°C
 to form the complex containing 1 atom of chromium to 1 mol. of monoazo dye

BIOS 961, 71
FIAT 764 — Palatinechtbraun BRRN

H_2SO_4 conc. — purple; on dilution — weak reddish violet
 solution, then ppt.

15690 C.I. Mordant Black 15 (Reddish navy → Bluish black)

2-Amino-6-nitro-1-phenol-4-sulfonic acid → 2-Naphthol

Discoverers — O. Ernst and K. Schirmacher 1900
 M.L.B., *BP* 2772/00; *USP* 667935; *FP* 300011; *GP* 143892
 (*Fr.* 7, 387)
FIAT 764 — Wollschwarz N

Soluble in water (violet to black)
 Moderately soluble in ethanol (reddish violet)
 Slightly soluble in acetone
 H_2SO_4 conc. — reddish violet; on dilution — orange, red ppt.
 Aqueous solution + HCl conc. — orange;
 + NaOH conc. — bordeaux

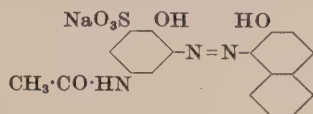
15691 C.I. Acid Black 43 (Reddish black)

A chromium complex derived from C.I.15690

Heat C.I.15690 with aqueous chromium formate at 100°C until all is in solution (3–5 hr.) to form the complex containing 1 atom chromium to 2 mol. monoazo dye

Ciba, *BP* 257820; *USP* 1626168; *FP* 609937; *Sw.P* 115111; *GP* 473527 (*Fr.* 16, 954)
I.G., *BP* 269522; *FP* 658253; *Sw.P* 128733; *GP* 455277 (*Fr.* 16, 965)
FIAT 764 — Palatinechtschwarz RRN

Soluble in water (violet black)
 H_2SO_4 conc. — greenish black; on dilution — violet brown ppt.
Aqueous solution + HCl — violet black ppt;
+ NaOH — brownish black

15695 C.I. Mordant Blue 4 (Dull reddish navy)

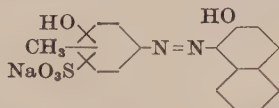
4-Acetamido-6-amino-1-phenol-2-sulfonic acid → 2-Naphthol

Discoverer — M. Hoffmann 1903

Cassella Co., *BP* 3182/03; *USP* 749195; *FP* 337011; *GP* 149106 (*Fr.* 7, 385)

FIAT 764 — Anthracenchromblau R

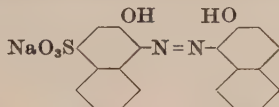
Soluble in water (scarlet) and ethanol (red)
 H_2SO_4 conc. — reddish violet; on dilution — orange
Aqueous solution + HCl conc. — brownish orange;
+ NaOH conc. — wine red to bordeaux

15700 C.I. Mordant Violet 30 (Bright bluish violet)

Aminohydroxytoluenesulfonic acid → 2-Naphthol

Brotherton & Co., *BP ap.* 6243/19

Soluble in hot water
 H_2SO_4 conc. — reddish brown; on dilution — brown ppt.
Aqueous solution + HCl — brown ppt;
+ NaOH — unaltered

15705 C.I. Mordant Black 17 (Dull reddish navy → Bluish black)

1-Amino-2-naphthol-4-sulfonic acid → 2-Naphthol

Soluble in water (wine red to bordeaux) and Cellosolve
Slightly soluble in ethanol and acetone
Insoluble in other organic solvents
 H_2SO_4 conc. — blue; on dilution — pale reddish brown (ppt.)
 HNO_3 conc. — yellow
NaOH 10% — red solution
Aqueous solution + HCl conc. — olive yellow brown, ppt;
+ NaOH conc. — violet black

Discoverers — P. Julius, H. Reindel and F. C. Günther 1903;
K. Elbel 1904; T. Sandmeyer 1904

Badische Co., *BP* 27372/03; *FP* 338819; *GP* 156440 (*Fr.* 8, 656). *BP* 4997/04; *USP* 770177; *FP* 338819 addn. of 17/12/03; *GP* 160536 (*Fr.* 8, 657)

Geigy, *BP* 15025/04; *USP* 793743; *FP* 350055; *GP* 181326 (*Fr.* 8, 666)

Ciba, *BP* 10022/05, *USP* 797441, 806415; *FP* 351125 and addn. of 10/5/05; *GP* 181714 (*Fr.* 8, 678). *BP* 7029/06; *FP* 351125 addn. of 19/6/05, *GP ap.* G 21484 (*Fr.* 8, 681)

Kalle Co., *BP* 23034/05; *USP* 807422; *FP* 353786; *GP* 175593, 178621, 178936, 195228, (*Fr.* 8, 648, 649, 650, 1379). *USP* 778476; *GP* 188645 (*Fr.* 8, 676)

FIAT 764 — Palatinchromschwarz 6BN

Tomiooka, *J. Chem. Ind. Tokyo*, 20 (1917), 577

Morgan & Main Smith, *JCS*, 125 (1924), 1732; *JSDC*, 41 (1925), 233

15706 C.I. Acid Blue 161 (Dull blue)

Chromium complex derived from C.I.15705

Heat C.I.15705 in aqueous solution with chromium formate for 3 hr. at 130°C

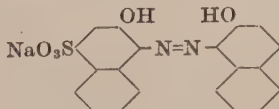
BIOS 961, 70

FIAT 764 — Palatinechtblau BN

Soluble in water (reddish blue)
Very slightly soluble in ethanol
 H_2SO_4 conc. — blue; on dilution — blue ppt.
Aqueous solution + HCl — blue ppt;
+ NaOH — reddish violet

15707 C.I. Acid Blue 193 (Reddish navy)

A 2:1 chromium complex of C.I. 15705:



1-Amino-2-naphthol-4-sulfonic acid → 2-Naphthol;

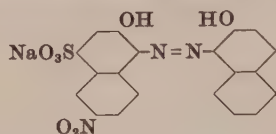
then convert to the chromium complex

Soluble in water and in ethanol (reddish blue)
 H_2SO_4 conc. — blue; on dilution — bluish violet
Aqueous solution + HCl — bluish violet;
+ NaOH — reddish blue

15708 C.I. Acid Violet 92 (Bluish violet)

A 2:1 cobalt complex of C.I. 15705

Soluble in water and in ethanol (violet)
 H_2SO_4 conc. — blue; on dilution — reddish brown with brown precipitate
Aqueous solution + HCl — violet; + NaOH — bluish red

15710 C.I. Mordant Black 1 (Bluish grey → Black)

1-Amino-6-nitro-2-naphthol-4-sulfonic acid → 2-Naphthol

Discoverer — J. Hagenbach 1904

Geigy, *BP* 15418/04, 15982/04; *USP* 790363; *FP* 350071; *GP* 164655, 169683, (*Fr.* 8, 647, 673)Kalle Co., *BP* 22200/09; *USP* 958912; *FP* 407227; *GP* 176619 (*Fr.* 8, 653), *GP ap.* K39667 (*Fr.* 10, 861)*FIAT* 764 — Salicinschwarz EAGBrenner, *Helv. Chim. Acta*, 3 (1920), 98Ruggli, Knapp, Merz & Zimmerman, *Helv. Chim. Acta*, 12 (1929), 1034Ruggli, Zimmerman & Knapp, *Helv. Chim. Acta*, 13 (1930), 784
King, *JCS* (1932), 1272

Soluble in water (navy blue)

Slightly soluble in ethanol and acetone

 H_2SO_4 conc. — blue; on dilution — pale yellowish brown HNO_3 conc. — reddish orangeAqueous solution + HCl conc. — pale yellowish brown;
+ NaOH conc. — orange red brown**15711 C.I. Acid Black 52 (Black)**

Chromium complex derived from C.I.15710

Heat C.I.15710 in aqueous solution with chromium formate for 2 hr. at 115°C; mix with half of a similar batch of unchromed dye, make alkaline with caustic soda and dry. The product contains approximately 2 atoms chromium to 3 mol. monoazo dye

Ciba, *BP* 364147; *USP* 1914052; *FP* 702388; *Sw.P* 147796; *GP* 564695 (*Fr.* 19, 1705)*BIOS* 1661, 74*FIAT* 764 — Palatinechtschwarz WAN ex.

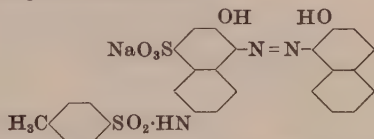
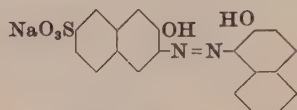
Soluble in water (reddish black), ethanol and Cellosolve

Slightly soluble in acetone

Insoluble in other organic solvents

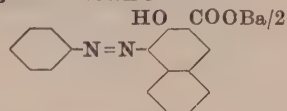
 H_2SO_4 conc. — dark blue; on dilution — black ppt. HNO_3 conc. — yellowish brown solution NaOH dil. — purplish black solution**15715 C.I. Acid Black 34 (Bluish grey)**

A chromium complex derived from

Reduce the nitro group in C.I.15711 to an amino group and condense with *p*-toluenesulfonyl chlorideI.G., *BP* 268754; *Sw.P* 126407; *GP* 453949 (*Fr.* 16, 962)*FIAT* 764 — Seidenechtgrau BB**15720 Mordant Dye**

3-Amino-2-naphthol-7-sulfonic acid → 2-Naphthol

Discoverer — A. Weinberg

M.L.B., *BP* 15176/89; *GP* 53076 (*Fr.* 2, 284)Cassella Co., *BP* 28107/97; *FP* 272620, 272621; *GP* 109932 (*Fr.* 5, 521)*C.I.206* (1st Ed.) — the association of Anthracene Chrome Blacks 5B and P with this constitution was incorrect (see C.I. 17135 and 16730). It is doubtful whether a dye of this constitution was ever marketedFriedländer & v. Zakrzewski, *Ber.* 27 (1894), 763Brenner, *Helv. Chim. Acta*, 3 (1920), 98**15800 C.I. Pigment Red 64 (Bright red)****15800:1** C.I. Pigment Red 64:1**15800:2** C.I. Pigment Brown 5

Aniline → 3-Hydroxy-2-naphthoic acid

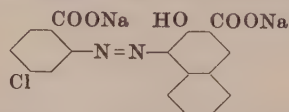
C.I. 15800:1 is the calcium salt

C.I. 15800:2 is the copper salt

Discoverers — S. von Kostanecki and Kernbaum

von Kostanecki, *Ber.* 26 (1893), 2898Strohbach, *Ber.* 34 (1901), 4164Interchemical Corp., *USP* 2335537 (Copper lake)

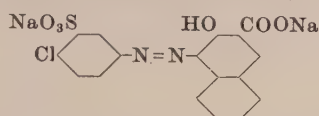
M.p. (from glacial acetic acid) 232°C

15820 C.I. Pigment Red 55 (Bordeaux)*

4-Chloroanthranilic acid → 3-Hydroxy-2-naphthoic acid

* Manganese salt

- 15825** C.I. Pigment Red 58 (*Reddish orange*)
15825:1 C.I. Pigment Red 58:1 (*Bright red*)
15825:2 C.I. Pigment Red 58:2 (*Bright bluish red*)
15825:3 C.I. Pigment Red 58:3 (*Bright reddish orange*)
15825:4 C.I. Pigment Red 58:4 (*Bluish red*)

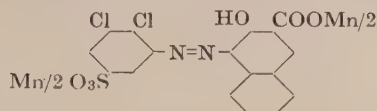


6-Chlorometanilic acid → 3-Hydroxy-2-naphthoic acid

C.I. 15825:1 is the barium salt
 C.I. 15825:2 is the calcium salt
 C.I. 15825:3 is the strontium salt
 C.I. 15825:4 is the manganese salt

BIOS 1661, 49, 112, 113
 FIAT 764 — Litholrubin GK Plv. (lake)

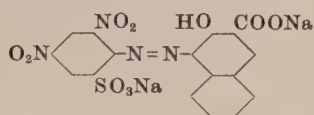
- 15826** C.I. Pigment Red 77 (*Bright red*)



4,5-Dichlorometanilic acid → 3-Hydroxy-2-naphthoic acid;
 then convert to the manganese salt

Discoverers — T. E. Ludwig and O. E. Knapp 1954
 USP 2694055

- 15840★** Dye for Pigments

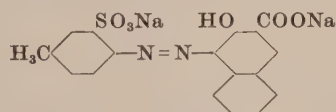


2-Amino-3,5-dinitrobenzenesulfonic acid
 → 3-Hydroxy-2-naphthoic acid

Discoverers — O. Ernst and H. Eichwede 1910
 M.L.B., BP 9407/10; USP 978865; FP 416052; GP ap. F27584
 (Fr. 10, 943)
 C.I.160 (1st Ed.) — Hansa Rubine G appears to have been
 wrongly associated with this constitution. Hansa Rubine G
 (IG) was C.I.15825 calcium lake (BIOS 1661, 113)
 Willard Joyce, *Ind. Eng. Chem.* **13** (1921), 946

Reactions of C.I.15840 (from USP 978865) —
 Slightly soluble in water and ethanol
 Insoluble in benzene
 H₂SO₄ conc. — bluish red; on dilution — red ppt.

- 15850** C.I. Pigment Red 57
15850:1 C.I. Pigment Red 57:1 (*Red, tint pale reddish violet*)
15850:2 C.I. Pigment Red 57:2 (*Bluish red*)



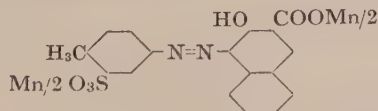
6-Amino-*m*-toluenesulfonic acid → 3-Hydroxy-2-naphthoic acid

C.I. 15850:1 is the calcium salt
 C.I. 15850:2 is the barium salt

Discoverers — R. Gley and O. Siebert 1903
 Agfa, BP 11004/03; USP 743071, 741029; FP 332145; GP 151205
 (Fr. 7, 451)
 BIOS 1661, 111
 FIAT 764 — Litholrubin BN Plv.
 Litholrubin BK Plv. (calcium lake)

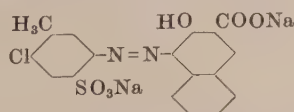
Soluble in hot water (yellowish red)
 Insoluble in ethanol
 H₂SO₄ conc. — magenta red; on dilution — magenta red ppt.
 Aqueous solution + HCl — brownish red ppt;
 + NaOH conc. — brown

- 15851** C.I. Pigment Red 115



5-Amino-*o*-toluenesulfonic acid → 3-Hydroxy-2-naphthoic acid;
 then convert to the manganese salt

- 15860** C.I. Pigment Red 52
15860:1 C.I. Pigment Red 52:1 (*Bright red*)
15860:2 C.I. Pigment Red 52:2 (*Bordeaux*)



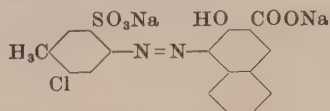
2-Amino-5-chloro-*p*-toluenesulfonic acid
 → 3-Hydroxy-2-naphthoic acid

C.I. 15860:1 is the calcium salt
 C.I. 15860:2 is the manganese salt

Discoverers — O. Ernst and H. Eichwede 1910
 M.L.B., USP 983486
 BIOS 986, 130 — (preparation of diazo component)
 C.I.166 (1st Ed.) Lithol Red GG (IG) has the constitution
 C.I.15590 (BIOS 961, 39). The association of Lithol Red
 3B (MLB) with C.I.15860 may also be incorrect

Reactions of C.I.15860 (from USP 983486) —
 Soluble in water (yellowish red)
 Insoluble in ethanol
 Aqueous solution + HCl — dark red ppt.

- 15865 C.I. Pigment Red 48**
15865:1 C.I. Pigment Red 48:1 (*Bright yellowish red, tint pink*)
15865:2 C.I. Pigment Red 48:2 (*Bright red, tint Bluish pink*)
15865:3 C.I. Pigment Red 48:3 (*Red*)
15865:4 C.I. Pigment Red 48:4 (*Red*)



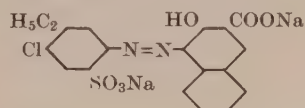
6-Amino-4-chloro-*m*-toluenesulfonic acid
 → 3-Hydroxy-2-naphthoic acid

C.I. 15865:1 is the barium salt
 C.I. 15865:2 is the calcium salt
 C.I. 15865:3 is the strontium salt
 C.I. 15865:4 is the manganese salt

BIOS 1548, 212
 FIAT 764 — Permanentrot BB ex. Plv.
 For preparation of the diazo component *see* —
 Badische Co., USP 759716; GP 175378 (*Fr.* 8, 712)

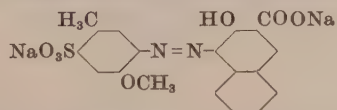
H₂SO₄ conc. — claret; on dilution — bluish red ppt.
 HNO₃ conc. — brownish red
 NaOH conc. — red

- 15867 C.I. Pigment Red 200** (*Bright bluish red*)



4-Amino-5-chloro-4-ethylbenzenesulfonic acid → 3-Hydroxy-2-naphthoic acid

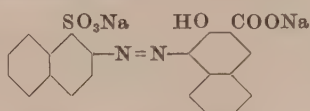
- 15870 C.I. Pigment Red 56** (*Bright bluish red*)



4-Amino-5-methoxy-*o*-toluenesulfonic acid
 → 3-Hydroxy-2-naphthoic acid
 C.I. Pigment Red 56 is the barium salt

BIOS 1661, 117, 118
 FIAT 764 — Permanentbordo R ex. Plv., RN ex. Plv.

- 15880 C.I. Pigment Red 63**
15880:1 C.I. Pigment Red 63:1 (*Bordeaux*)
15880:2 C.I. Pigment Red 63:2 (*Bordeaux*)



Tobias acid → 3-Hydroxy-2-naphthoic acid

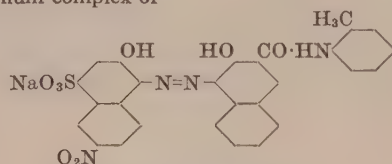
C.I. 15880:1 is the calcium salt
 C.I. 15880:2 is the manganese salt

Discoverers — O. Ernst and G. Gulbransson 1907
 M.L.B., BP 7351/07; USP 858065; FP 385570; GP 205080
 (*Fr.* 9, 424)
 BIOS 1661, 86
 FIAT 764 — Lackbordo BN
 Vlies, JSDC, 30 (1914), 106

Calcium lake —
 Insoluble in water
 Very slightly soluble in ethanol
 H₂SO₄ conc. — bluish crimson; on dilution — brownish crimson ppt.
 HNO₃ conc. — dull crimson
 NaOH conc. — brownish red solution

- 15900 C.I. Acid Black 124** (*Bluish grey*)

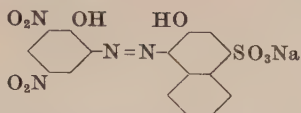
A 2:1 chromium complex of



1-Amino-6-nitro-2-naphthol-4-sulfonic acid
 → 3-Hydroxy-2-naphtho-*o*-toluidide;

then convert to the chromium complex

Soluble in water (bluish grey) and in ethanol (greenish grey)
 H₂SO₄ conc. — bluish green; on dilution — violet
 Aqueous solution + HCl — greenish grey;
 + NaOH — bluish grey

15950**Mordant Dye**

Picramic acid → 2-Naphthol-4-sulfonic acid

Discoverer — H. Geldermann 1911

Metachrome Black A (A)

Mordant black, fast to light and only moderate fastness to milling

Agfa, *BP* 73/11; *USP* 1011770; *FP* 423809*FIAT* 764 — Metachromschwarz A**15951****Solvent Dye**

An amine salt of a chromium complex of C.I.15950

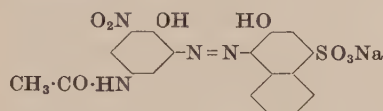
Heat C.I.15950 in aqueous solution with chromium formate for 3 hr. at 110°C to form the chromium complex then treat with isopentadecylamine acetate to precipitate the amine salt

Discoverer — H. Krzikalla 1941

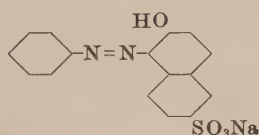
Zapon Fast Black NCB (IG)I.G., *USP* 2215105; *GP* 703456*FIAT* 764 — Zaponechtschwarz NCB

Insoluble in water

Soluble in ethanol and acetone

15955**Mordant Dye**

4-Acetamido-2-amino-6-nitrophenol → 2-Naphthol-4-sulfonic acid

Diamond Grey BL (By)*FIAT* 764 — Diamantgrau BL**15970****C.I. Acid Orange 12 (Bright orange)****C.I. Food Orange 1 (Bright reddish orange)****15970:1** **C.I. Pigment Orange 18 (Bright reddish orange)**

Aniline → Schaeffer's acid

Discoverer — P. Griess 1878

FIAT 764 — Croceinorange G, Ponceau 4GBLGriess, *Ber.* **11** (1878), 2197Möhlau & Maetzel, *Ber.* **46** (1913), 456King, *JCS*, (1929), 607Waterman, Groot & van Tussenbroek, *Koll. Z.* **48** (1929), 146Bucherer & Hanusch, *J. prakt. Chem.* **132** (1931), 281

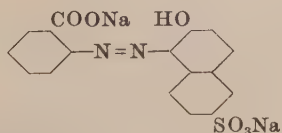
Soluble in water (golden orange)

Slightly soluble in ethanol (golden orange), acetone and Cellosolve

Insoluble in other organic solvents

 H_2SO_4 conc. — golden orange; on dilution — golden orange HNO_3 conc. — brown solution turning redAqueous solution + HCl conc. — golden orange;+ Na_2CO_3 10% — no change;+ NaOH conc. — brownish orange

C.I. 15970:1 is the calcium salt

15975**C.I. Mordant Red 60 (Red)**

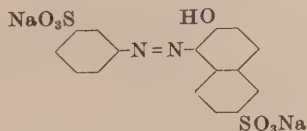
Anthranilic acid → Schaeffer's acid

Discoverer — K. Schirmacher 1906

M.L.B., *BP* 11759/06 (void); *USP* 837128; *FP* 336110;*GP* 175828 (*Fr.* **8**, 729)

Pigment Scarlet J (Fran) is a salt of this dye

Insoluble in water

 NaOH — yellowish red solution**15980****C.I. Food Orange 2 (Bright orange)**

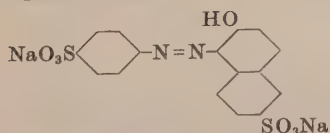
Metanilic acid → Schaeffer's acid

Soluble in water (golden yellow)

Slightly soluble in ethanol (pale golden yellow)

 H_2SO_4 conc. — orange; on dilution — golden orangeAqueous solution + HCl conc. — golden yellow;+ NaOH conc. — reddish orange brown**15985****C.I. Food Yellow 3 (Bright reddish yellow)**

→ Bright yellowish orange)

15985:1 **C.I. Pigment Yellow 104**

Sulfanilic acid → Schaeffer's acid

C.I. 15985:1 is the aluminium salt

Discoverer—Warner-Jenkinson Manufacturing Co.

Whitmore & Revukas, *JACS*, **59** (1937), 1501Stein, *J. Assoc. Offic. Agr. Chemists*, **32** (1949), 672

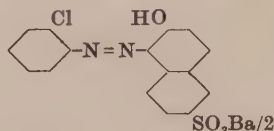
Soluble in water (yellowish orange)

Very slightly soluble in ethanol

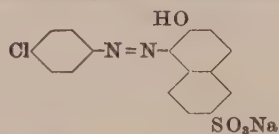
 H_2SO_4 conc. — reddish orange; on dilution — yellowAqueous solution + HCl conc. — unchanged;+ NaOH conc. — brownish red

15990 C.I. Pigment Orange 19 (Bright reddish orange)

BIOS 961, 35
 BIOS 1661, 80
 FIAT 764 — Helioorange TD

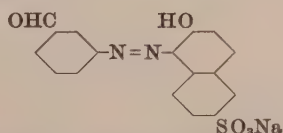


o-Chloroaniline → Schaeffer's acid;
 then treat a suspension of the dye with an aqueous solution of barium chloride
 and heat to 100°C to form the barium lake

15995 C.I. Acid Orange 31 (Bright orange)

p-Chloroaniline → Schaeffer's acid

Soluble in water (reddish orange) and ethanol
 Very soluble in Cellosolve
 H₂SO₄ conc. — orange; on dilution — yellowish orange
 Aqueous solution + H₂SO₄ 10% — orange;
 + NaOH 10% — orange brown

16000 Acid Dye

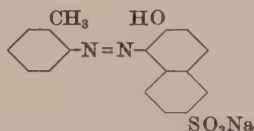
m-Aminobenzaldehyde → Schaeffer's acid

Discoverer — K. Thiess 1923

Amido Fast Orange G (MLB)

Dyes wool in the presence of sulfuric acid
 M.L.B., USP 1540666; FP 573603

Soluble in water and ethanol (orange yellow)
 H₂SO₄ conc. — yellowish red; on dilution — cloudy orange
 Aqueous solution + HCl — cloudy orange;
 + NaOH — brownish orange

16010 Acid Dye

o-Toluidine → Schaeffer's acid

Note — Numerous commercial variations are, or have been, made by
 using isomeric toluidines or mixtures of them and by replacing part of the
 Schaeffer's acid by *R* acid. (Compare C.I.16011, 16020)

Discoverer — Bayer Co. 1889

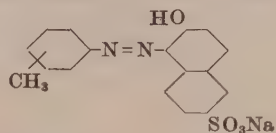
Levinstein Ltd., BP 623/1879

Bayer Co., BP 2411/83; GP 26231 (*Fr.* 1, 368)

FIAT 764 — Orange GT

Seyewetz & Chaix, *Bull. Soc. chim.* 41 (1927), 332

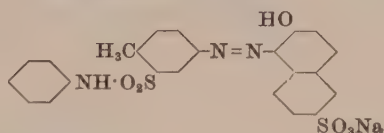
Soluble in water (reddish orange) and ethanol (brownish orange)
 H₂SO₄ conc. — red; on dilution — reddish orange
 Aqueous solution + HCl conc. — reddish orange brown, ppt;
 + NaOH conc. — brownish orange

16011 C.I. Acid Orange 16 (Bright reddish orange)

Mixed *o*-, *m*- and *p*-Toluidines → Schaeffer's acid

FIAT 764 — Brillantorange ON, ONZ

Soluble in water (brownish orange) and ethanol (golden orange)
 H₂SO₄ conc. — red; on dilution — orange
 Aqueous solution + HCl conc. — reddish orange brown;
 + NaOH conc. — orange brown

16015 C.I. Acid Orange 41 (Orange)

5-Amino-*o*-toluenesulfonanilide → Schaeffer's acid

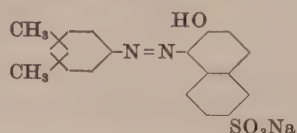
Discoverers — O. Dressel, R. Kothe, and H. Horlein 1909

Bayer Co., BP 933/10; USP 989954; GP 230594 (*Fr.* 10, 807)

BIOS 1548, 44

FIAT 764 — Walkorange GN

Soluble in water and ethanol (golden orange)
 H₂SO₄ conc. — reddish orange; on dilution — golden orange
 Aqueous solution + HCl conc. — golden orange, ppt;
 + NaOH conc. — brownish orange

16020 C.I. Acid Orange 17 (Reddish orange)

Mixed Xylidines → Schaeffer's acid

Note — Numerous commercial variations are, or have been, made by
 using particular xylidine fractions or replacing part of the xylidines by
 toluidines or by *o*-anisidine, also by replacing part of the Schaeffer's acid by
R acid. Examples of such mixed dyes are Ponceau GR II, R, RR, 3R and
 3RL (FIAT 764). (Compare C.I.16150, 16151, 16152)

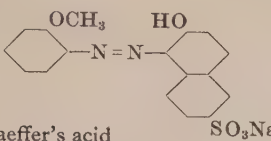
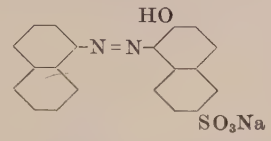
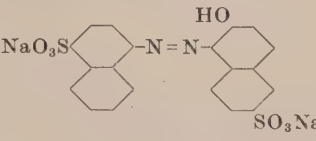
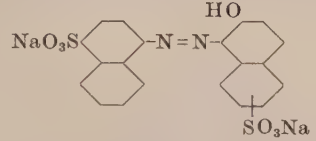
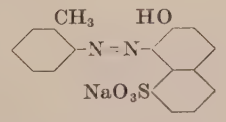
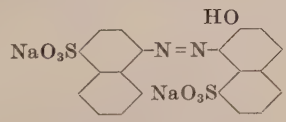
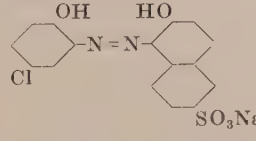
Discoverer — Levinstein Ltd. 1879

Lev., BP 623/79

FIAT 764 — Brillantorange R

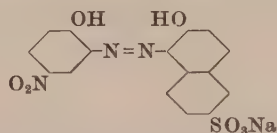
Liebermann, *Ber.* 16 (1883), 2864

Soluble in water (orange red) and ethanol (orange)
 Insoluble in benzene
 H₂SO₄ conc. — red; on dilution — orange red
 HNO₃ conc. — yellowish red solution
 Aqueous solution + HCl conc. — orange red;
 + NaOH conc. — brownish orange

| | |
|---|--|
| 16030 Acid Dye  OCH_3 HO SO_3Na <i>o</i> -Anisidine → Schaeffer's acid | Component of certain mixed dyes of the Ponceau class. See for example C.I.16151 Fierz David & Ischer, <i>Helv. Chim. Acta</i> , 21 (1938), 664 (Copper complex) |
| 16040 C.I. Acid Red 11 (Red)  HO SO_3Na 1-Naphthylamine → Schaeffer's acid | Discoverer — H. Caro 1878 Badische Co., BP 786/78; USP 204799; FP 123148; GP 5411 (Fr. 1, 358) King, <i>JCS</i> , 132 (1927), 2639 Slightly soluble in water (bluish red to bordeaux) and ethanol (red) H_2SO_4 conc. — deep blue; on dilution — reddish brown Aqueous solution + HCl conc. — reddish brown; + NaOH conc. — brown |
| 16045 C.I. Acid Red 13 (Red) C.I. Food Red 4  NaO_3S HO SO_3Na Naphthionic acid → Schaeffer's acid The aluminium salt is used for colouring pharmaceuticals | Discoverer — H. Caro 1878 Badische Co., BP 786/78; USP 204799; FP 123148; GP 5411 (Fr. 1, 358) FIAT 764 — Ectrot E Standards BS 4287:1968 Fast Red E for use in Foodstuffs India IS 1964 2924 Fast Red E Soluble in water (cherry red) Slightly soluble in ethanol (weak reddish violet brown) Very slightly soluble in acetone H_2SO_4 conc. — violet; on dilution — cherry red (orange ppt.) HNO_3 conc. — yellowish red Aqueous solution + HCl conc. — reddish orange brown; + NaOH conc. — orange brown |
| 16046 Acid Dye  NaO_3S HO SO_3Na Naphthionic acid → [Schaeffer's acid (0.2 mol.)] [Crocein acid (0.8 mol.)] | Discoverer — Agfa Crocein XGXF (A) Soluble in water (yellowish orange) Slightly soluble in ethanol (brownish orange) H_2SO_4 conc. — reddish violet; on dilution — reddish orange Aqueous solution + HCl conc. — yellowish orange; + NaOH conc. — brownish orange |
| 16047 C.I. Acid Red 25:1 (Red) Mixture of dyes including C.I.16010, C.I.16045, C.I.16050 and  CH_3 HO NaO_3S $\left. \begin{array}{l} \text{o-Toluidine 0.15 mol.} \\ \text{Naphthionic acid 0.85 mol.} \end{array} \right\} \rightarrow \left\{ \begin{array}{l} \text{Schaeffer's acid 0.15 mol.} \\ \text{Crocein acid 0.85 mol.} \end{array} \right.$ | Discoverer — C. Rumpff 1882 Bayer Co., BP 2030/81; USP 256376; GP 20402 (Fr. 1, 372) Crocein Scarlet 3BX (By) Soluble in water Slightly soluble in ethanol (reddish orange) H_2SO_4 conc. — reddish violet; on dilution — pink Aqueous solution + HCl conc. — reddish orange; + NaOH conc. — yellowish orange |
| 16050 C.I. Acid Red 25 (Red)  NaO_3S HO NaO_3S Naphthionic acid → Crocein acid | Discoverer — C. Rumpff 1882 Bayer Co., BP 1225/81, 2030/81; USP 256376; GP 20402 (Fr. 1, 373) BP 2411/83, 8390/84 (Separation of Crocein acid by coupling out Schaeffer's acid from mixture) FIAT 764 — Ponceau 3RO Soluble in water (red) Moderately soluble in ethanol H_2SO_4 conc. — reddish violet; on dilution — red Aqueous solution + HCl conc. — red; + NaOH conc. — yellow brown |
| 16055 C.I. Acid Violet 56 (Bluish violet) A chromium complex derived from  OH HO Cl SO_3Na 5-Chloro- <i>o</i> -anisidine → (bicarb.)Schaeffer's acid; then heat in aqueous solution with chromium formate at 125°C–135°C for 7 hr. to form the chromium complex. (During the chroming process the methoxy group is replaced by a hydroxy group) | Discoverer — H. Krzikalla 1926 I.G., BP 296819; FP 638722; GP 474997 (Fr. 16, 968) BIOS 961, 74 FIAT 764 — Palatinechtviolett 3RN Soluble in water (violet) and ethanol Slightly soluble in Cellosolve H_2SO_4 conc. — bluish red; on dilution — red to violet NaOH 10% — bluish red solution Aqueous solution + H_2SO_4 10% — bluer |

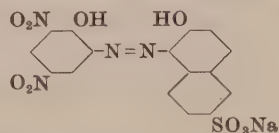
16060 C.I. Mordant Red 34 (Bluish red)

Discoverer — Badische Co.



2-Amino-4-nitrophenol → Schaeffer's acid

Soluble in water (orange brown)
 Moderately soluble in ethanol
 H_2SO_4 conc. — red; on dilution — orange
 Aqueous solution + HCl conc. — orange;
 + NaOH conc. — orange brown

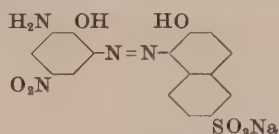
16065 C.I. Mordant Brown 60 (Dull reddish brown)

Picramic acid → Schaeffer's acid

Soluble in water (violet)
 H_2SO_4 conc. — red; on dilution — orange ppt.
 Aqueous solution + HCl conc. — orange brown ppt;
 + NaOH conc. — brownish violet ppt.

16070 C.I. Mordant Brown 61 (Dull reddish brown)

FIAT 764 — Chromechtbraun V

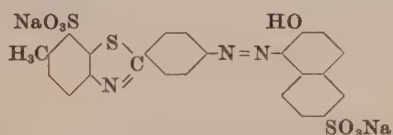


Reduce one nitro group in C.I.16065 with sodium sulfide

Soluble in water (bluish red) and Cellosolve
 Slightly soluble in ethanol and acetone
 H_2SO_4 conc. — pink to red; on dilution — orange ppt.
 HNO_3 conc. — pink, turns orange
 HCl conc. — pink solution
 Aqueous solution + NaOH 10% — red

16080 Direct Dye

Clayton Cloth Scarlet (CAC)

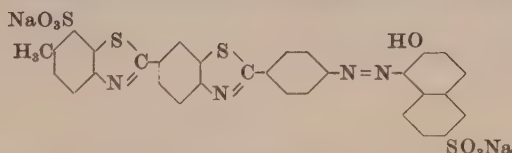
Dehydrothio-*p*-toluidinesulfonic acid → Schaeffer's acid

Dahl Co., *FP* 192628; *GP* 48465 (*Fr.* 2, 294)
 Geigy, *USP* 398990; *FP* 196988

Soluble in water (wine red)
 H_2SO_4 conc. — crimson red; on dilution — yellowish red ppt.
 Aqueous solution + HCl — reddish orange soluble ppt;
 + NaOH — darker solution

16081 C.I. Direct Red 70 (Yellowish pink → Yellowish red)

Dahl Co., *FP* 192628; *GP* 48465 (*Fr.* 2, 294)
 Geigy, *USP* 398990; *FP* 196988

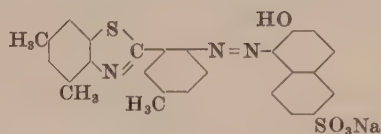


Primuline (C.I.49000) → Schaeffer's acid

Soluble in water (orange red)
 H_2SO_4 conc. — blood red; on dilution — orange ppt.
 Aqueous solution + HCl — orange red ppt;
 + NaOH — darker solution

16085 Acid Dye

Discoverers — G. Schultz and Sansome 1891

2-(6-Amino-*m*-tolyl)-4,6-dimethylbenzothiazole → Schaeffer's acid

Emin Red (A)

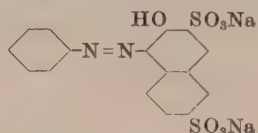
Dyes wool and silk in the presence of acid. The shade is rendered duller and faster by afterchroming

JSDC, 8 (1892), 167
 Paul, *Z. angew. Chem.* 9 (1896), 680

Soluble in water (yellowish red)
 H_2SO_4 conc. — carmine; on dilution — red ppt.
 Aqueous solution + HCl — red ppt;
 + NaOH — yellower

16100 C.I. Acid Orange 14 (Bright reddish orange)

Discoverer — H. Baum 1878



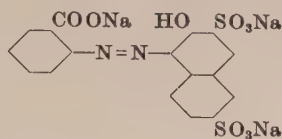
Aniline → R acid

M.L.B., *BP* 1715/78; *USP* 251162; *FP* 124811; *GP* 3229 (*Fr.* 1, 377)
 M.L.B., *BP* 816/84; *USP* 314938, 331059; *FP* 159998; *GP* 36491 (*Fr.* 1, 381)
 Bayer & Kegel, *BP* 7097/84; *USP* 351056; *FP* 161840; *GP* 33916 (*Fr.* 1, 383)
 Witt, *Ber.* 21 (1888), 3481
 Grandmougin, *J. prakt. Chem.* 76 (1907), 129
 King, *JCS* (1929), 607

H_2SO_4 conc. — cherry red; on dilution — orange
 Aqueous solution + HCl — unaltered;
 + NaOH — yellower

Soluble in water (reddish orange)
 Slightly soluble in ethanol (orange)

16105 C.I. Mordant Red 9 (Bluish red)
16105:1 C.I. Pigment Red 60 (Bright red)*



Anthranilic acid → R acid

C.I. 16105:1 is the barium salt

Discoverer — G. Gullbransson 1902

M.L.B., BP 23830/02; USP 757109; FP 328128; GP 141257 (Fr. 7, 462)

BIOS 961, 58. BIOS 1661, 152

FIAT 764 — Saeurealizarinrot B (Pigmentscharlach 3B)

Soluble in water (orange)

Slightly soluble in ethanol, acetone and Cellosolve

Insoluble in other organic solvents

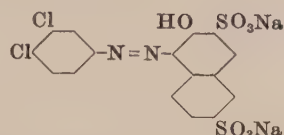
H₂SO₄ conc. — yellowish red; on dilution — orange ppt.

HNO₃ conc. — orange solution

NaOH 10% — orange

Aqueous solution + H₂SO₄ 10% — yellower

16110 Dye for Pigments



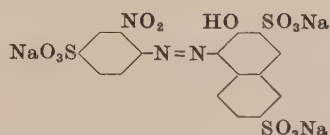
3,4-Dichloroaniline → R acid

Helio Fast Scarlet RL (IG)

Pigment for wallpaper

FIAT 764 — Helioechtscharlach RL

16115 Dye for Pigments



3-Nitrosulfanilic acid → R acid

Discoverer — Bayer Co. 1904

Helio Orange GL (By)

The barium salt is an orange pigment used for printing inks and wallpapers. Fastness: water, alkalis, acids, ethanol, linseed oil, light — good

BIOS 1661, 79

FIAT 764 — Helioorange GL

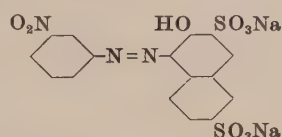
Soluble in water (orange)

H₂SO₄ conc. — cherry red; on dilution — orange yellow

Aqueous solution + HCl — no significant change;

+ NaOH — dark violet red

16120 C.I. Acid Orange 18 (Orange)



m-Nitroaniline → R acid

Discoverers — Z. Roussin and A. F. Poirrier 1878

BP 4490/78; FP 127221; GP 6715 (Fr. 1, 531)

Stebbins, JACS, 2 (1880), 446

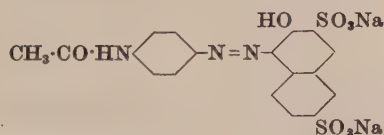
Soluble in water (reddish yellow)

H₂SO₄ conc. — orange yellow; on dilution — orange yellow ppt, then yellow solution

Aqueous solution + HCl — orange yellow ppt. soluble on dilution;

+ NaOH — yellowish brown

16130 C.I. Acid Red 23 (Red)



p-Aminoacetanilide → R acid

Discoverer — R. Nietzki 1884

Nietzki, Ber. 17 (1884), 344

Soluble in water (red)

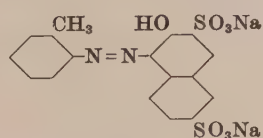
Very slightly soluble in ethanol

H₂SO₄ conc. — red; on dilution — red

Aqueous solution + HCl conc. — red;

+ NaOH conc. — reddish orange brown

16140 C.I. Acid Red 24 (Yellowish red)



o-Toluidine → R-acid

Discoverer — H. Baum 1878

M.L.B., BP 1715/78; USP 210233, 210293, 251162-4;

FP 124811; GP 3229 (Fr. 1, 377)

FIAT 764 — Excelsiorlackponceau JN

Soluble in water

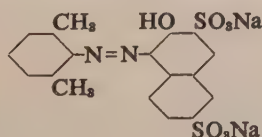
Slightly soluble in ethanol (orange red)

H₂SO₄ conc. — orange red; on dilution — orange red

Aqueous solution + HCl conc. — orange red;

+ NaOH conc. — orange brown

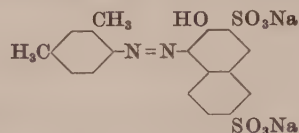
16149 C.I. Acid Orange 134 (Reddish orange)



2,6-Xylidine → R acid

American Perfumer & Cosmetics, 83 (Mar 1968) 29

16150 C.I. Acid Red 26 (Bright yellowish red)
C.I. Food Red 5 (Bright yellowish red → Bright red)



2,4-Xylidine → R acid

Discoverer — H. Baum 1878

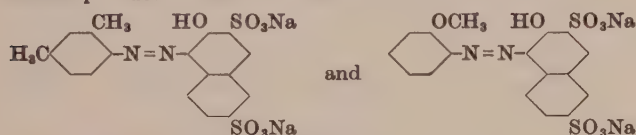
Patents as for C.I.16140
Grandmougin, *J. prakt. Chem.* **76** (1907), 128
King, *JCS*, **1929**, 608

Soluble in water (bright reddish orange to red)
Very slightly soluble in ethanol and acetone
Insoluble in other organic solvents
H₂SO₄ conc. — cherry red to magenta; on dilution — yellowish red

Aqueous solution + HCl conc. — red, ppt;
+ HNO₃ conc. — bright red becoming orange;
+ NaOH conc. — orange brown;
+ NaOH 10% — brownish red

16151 C.I. Acid Red 26:1 (Bright red)

Mixture produced *in situ* of



2,4-Xylidine }
o-Anisidine } → R acid

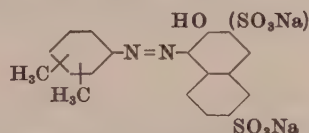
Note — In Ponceau 3R (IG) the mixed diazo component consisted of 80% 2,4-xylidine and 20% o-anisidine and in Ponceau 3RL (IG) 30% and 70% respectively; in both dyes the R acid used contained about 2% of Schaeffer's acid

Discoverer — H. Baum 1878

Patents as for C.I.16140
FIAT 764 — Ponceau 3R

Soluble in water (red)
Slightly soluble in ethanol
H₂SO₄ conc. — magenta red; on dilution — red
Aqueous solution + HCl conc. — red;
+ NaOH conc. — orange brown

16152 C.I. Acid Red 26:2 (Bright red)



Mixed Xylidines → (Schaeffer's acid + R acid)

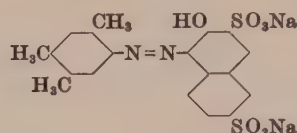
Note — In Ponceau RR (IG) the diazo component was 2,4-xylidine and the end component consisted of 13% Schaeffer's acid + 87% R acid

Discoverer — H. Baum 1878

Patents as for C.I.16140
FIAT 764 — Ponceau GR II
Ponceau RR

Soluble in water (red)
Moderately soluble in ethanol (orange)
H₂SO₄ conc. — magenta red; on dilution — orange red
Aqueous solution + HCl conc. — reddish orange;
+ NaOH conc. — orange brown

16155 Acid Dye (Bright yellowish red)



Pseudocumidine → R acid
Formerly used as a Food Dye

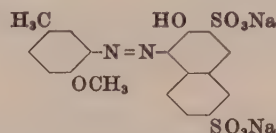
Discoverer — H. Baum 1878

M.L.B., BP 1715/78; USP 251163; FP 124811; GP 3229 (Fr. 1, 377)

Patents as for C.I.16140
Steigler, *Ind. Eng. Chem.* **10** (1918), 600
Whitmore & Revukas, *JACS*, **59** (1937), 1501

Soluble in water (red)
Slightly soluble in ethanol
H₂SO₄ conc. — magenta red; on dilution — red
Aqueous solution + HCl conc. — red;
+ NaOH conc. — orange brown

16160 Acid Dye



Cresidine → R acid

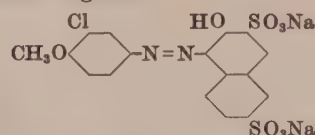
Discoverer — H. Baum 1878

Coccinine B, C (MLB)

Dyes wool in the presence of acid
M.L.B., BP 4914/78; USP 250038; FP 124811; GP 7217 (Fr. 1, 379)

Soluble in water (cherry red)
H₂SO₄ conc. — cherry red; on dilution — unaltered
Aqueous solution + HCl — darker red;
+ NaOH — brown ppt, soluble to reddish brown solution

16165 Dye for Pigments



3-Chloro-*p*-anisidine → R acid

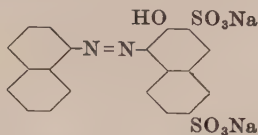
BIOS 1661, 85

FIAT 764 — Lackbordo B

Lake Bordeaux B (IG)

The heavy metal salts are used as pigments

16180 C.I. Acid Red 17 (Bluish red)



1-Naphthylamine → R acid

Discoverer — H. Baum 1878

M.L.B., *BP* 1715/78; *USP* 251164; *FP* 124811; *GP* 3229 (*Fr.* 1, 377)

Badische Co., *BP* 786/78; *USP* 204799; *FP* 123148; *GP* 5411 (*Fr.* 1, 358)

FIAT 764 — Bordo R

Alexander, *Analyst*, **72** (1947), 56 (use as indicator)

Soluble in water (magenta red)

Slightly soluble in ethanol and Cellosolve

Insoluble in other organic solvents

H₂SO₄ conc. — deep blue; on dilution — magenta red

HNO₃ conc. — slightly soluble (bluish red becoming yellowish red)

NaOH 10% — reddish brown solution

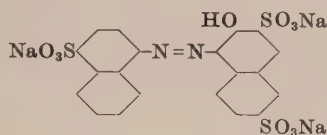
Aqueous solution + HCl conc. — wine red;

+ NaOH conc. — orange brown

16185 C.I. Acid Red 27 (Bluish red)

C.I. Food Red 9 (Bluish red)

16185:1 C.I. Pigment Red 193 (Bluish red)



Naphthionic acid → R acid

C.I. 16185:1 is the aluminium salt

Discoverer — H. Baum 1878

M.L.B., *BP* 1715/78; *FP* 124811; *GP* 3229 (*Fr.* 1, 377)

Badische Co., *BP* 786/78; *USP* 204799; *FP* 123148; *GP* 5411 (*Fr.* 1, 358)

Knecht, *JSDC*, **2** (1886), 24

JSDC, **10** (1894), 150

King, *JCS* (1929), 608

Slightly soluble in water (magenta red)

Very slightly soluble in ethanol and Cellosolve

H₂SO₄ conc. — violet; on dilution — pink

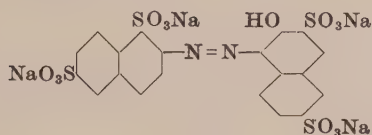
HNO₃ conc. — bright red solution

HCl conc. — brownish solution, black residue

Aqueous solution + HCl conc. — magenta red;

+ NaOH conc. — reddish brown

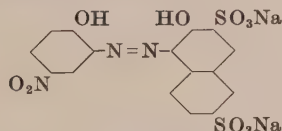
16190 Dye for Pigments



2-Amino-1,6-naphthalenedisulfonic acid → R acid

C.I.200 (1st Ed.) — associates this constitution with Helio Purpurine 7BL but this was probably an error. Compare C.I.27310

16200 C.I. Mordant Red 44 (Bright bluish red)



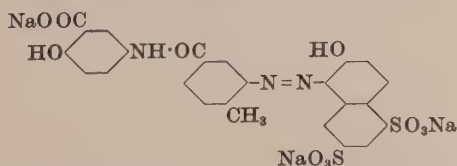
2-Amino-4-nitrophenol → R acid

Soluble in water (violet red)

H₂SO₄ conc. — red; on dilution — reddish orange

Aqueous solution + HCl conc. — reddish orange

16220 C.I. Mordant Orange 19 (Reddish orange)



5-(3-Amino-4-methylbenzamido)salicylic acid
→ 2-Naphthol-5,7-disulfonic acid

Discoverers — H. Jordan and W. Neelmeier 1912

Bayer Co., *GP* 268791 (*Fr.* 11, 396)

FIAT 764 — Chromechtorange RD

Soluble in water (golden orange)

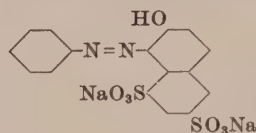
Moderately soluble in ethanol (golden yellow)

H₂SO₄ conc. — golden orange; on dilution — golden orange

Aqueous solution + HCl conc. — orange;

+ NaOH conc. — brownish orange

16230 C.I. Acid Orange 10 (Bright orange)
C.I. Food Orange 4 (Bright yellowish orange
 → Bright orange)



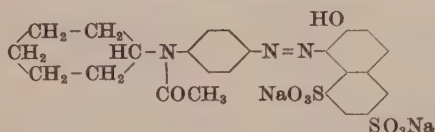
Aniline → G acid

H₂SO₄ conc. — yellowish orange; on dilution — yellower
 HNO₃ conc. — wine coloured solution, turns orange
 Aqueous solution + HCl conc. — yellow orange;
 + HNO₃ conc. — wine red, becoming orange;
 + NaOH conc. — orange brown

Discoverer — H. Baum 1878
 M.L.B., BP 1715/78; FP 124811; GP 3229 (Fr. 1, 377). BP 816/84; USP 314938, 331059; FP 159998; GP 36491 (Fr. 1, 381)
 Bayer & Kegel, BP 7097/84; USP 351056; FP 161840; GP 33916 (Fr. 1, 383)
 Gans & Co., GP 35019 (Fr. 1, 382)
 FIAT 764 — Orange GG
 Witt, Ber. 21 (1888), 3481
 Grandmougin, J. prakt. Chem. 76 (1907), 129
 Drew & Landquist, JCS (1938), 298
 King, JCS (1927), 2639
 Goodall, JSDC, 44 (1928), 145

Soluble in water (orange)
 Slightly soluble in ethanol (golden orange) and Cellosolve
 Insoluble in other organic solvents

16240 C.I. Acid Orange 28 (Bright orange)

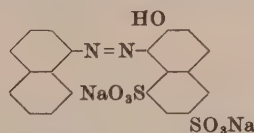


p-Amino-N-cyclohexylacetanilide → G acid

Discoverers — G. Kalischer and R. Fleischhauer 1929
 I.G., BP 340640; USP 1905294; FP 699897; GP 539725 (Fr. 18, 967)
 BIOS 1548, 45
 FIAT 764 — Supraminorange G

Soluble in water and ethanol (golden orange)
 H₂SO₄ conc. — golden orange; on dilution — golden yellow
 Aqueous solution + HCl conc. — golden orange;
 + NaOH conc. — reddish orange brown

16250 C.I. Acid Red 44 (Bright red)

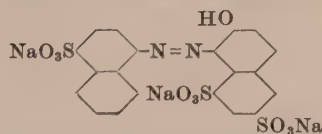


1-Naphthylamine → G acid

Discoverer — M. Hoffmann 1883
 M.L.B., GP 36491 (Fr. 1, 381)
 Cassella Co., BP 816/84; USP 332528
 FIAT 764 — Kristallponceau 6R, 6R ex.
 Sisley, Bull. Soc. chim. 25 (1901), 873
 Knecht & Hibbert, Ber. 36 (1903), 1553
 King, JCS (1927), 2639
 Seyewetz & Chaix, Bull. Soc. chim. 41 (1927), 332

Soluble in water (red) and ethanol (yellowish red)
 Very slightly soluble in acetone
 H₂SO₄ conc. — reddish blue; on dilution — scarlet red
 Aqueous solution + HCl — darker, brown crystalline plates ppt. with excess;
 + NaOH conc. — yellowish brown

16255 C.I. Acid Red 18 (Bright red)
C.I. Food Red 7 (Bright yellowish red → Bright red)



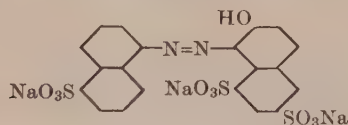
Naphthionic acid → G acid

H₂SO₄ conc. — violet; on dilution — reddish orange
 HNO₃ conc. — yellow solution
 Aqueous solution + HCl conc. — red;
 + NaOH conc. — brown

Discoverer — H. Baum 1878
 M.L.B., BP 816/84; USP 314938; FP 160082; GP 36491 (Fr. 1, 381)
 Badische Co., BP 786/78; USP 204799; FP 123148; GP 5411 (Fr. 1, 358)
 FIAT 764 — Viktoriascharlach 3R
 King, JCS, (1929) 608
 Whitmore & Revukas, JACS, 59 (1937), 1501

Soluble in water (red)
 Slightly soluble in ethanol and Cellosolve
 Insoluble in other organic solvents

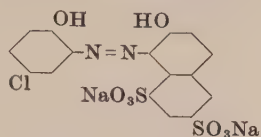
16256 C.I. Acid Red 353 (Yellowish red)



5-Amino-1-naphthalenesulfonic acid → G-acid

16260 C.I. Acid Violet 58 (Dull violet)

A chromium complex of the monoazo dye

5-Chloro-*o*-anisidine → G acid;

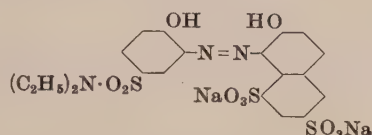
then heat in aqueous solution with chromium formate at 120°–135°C over 4 hr. to form the chromium complex. Dry in the presence of basic chromium formate. (During the chroming process the methoxyl group is replaced by a hydroxyl group)

Discoverers — K. Holzach, F. v. Rosenberg, and F. Lange 1930
I.G., BP 296819; FP 638722; GP 474997 (Fr. 16, 968), 545624 (Fr. 18, 1021), 575112 (Fr. 19, 1722)
BIOS 961, 74. BIOS 1548, 31
FIAT 764 — Palatinechtviolett 5RNA

Soluble in water (violet) and ethanol
Slightly soluble in Cellosolve
H₂SO₄ conc. — bluish red; on dilution — red to violet
NaOH 10% — red solution

16265 C.I. Acid Red 187 (Bluish red)

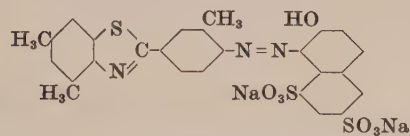
A chromium complex of the monoazo dye

N¹,N¹-Diethyl-4-methoxymetanilamide → G acid;

then heat in aqueous solution with chromium sulfate for 2 hr. at 130°C and 2 hr. at 135°C. Dry in the presence of basic chromium sulfate. (During the chroming process the methoxyl group is replaced by a hydroxyl group)

Discoverers — H. Krzikalla, W. Kühne, and F. Lange 1932
I.G., BP 395968; USP 1978880; FP 638772; GP 584645 (Fr. 20, 1165)
BP 408590; USP 2033341; FP 756349; GP 617085 (Fr. 22, 891)
BIOS 961, 71. BIOS 1548, 29
FIAT 764 — Palatinechtbordo BN

Soluble in water (violet) and ethanol
Slightly soluble in Cellosolve
H₂SO₄ conc. — bluish red; on dilution — red to violet
NaOH 10% — red solution

16280 Direct Dye2-(4-Amino-*m*-tolyl)-4,6-dimethylbenzothiazole → G acid

Discoverer — G. Schultz 1888

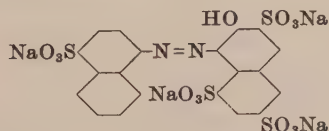
Erika G Extra (A)

Anschutz & Schultz, Ber. 22 (1899), 583

Soluble in water (bluish red)
H₂SO₄ conc. — (GN) reddish violet (4GN) magenta; on dilution — red solutions then red ppt.
Aqueous solution + HCl — (GN and 4GN) soluble bluish red ppt;
+ NaOH conc. — (GN) soluble violet ppt, (4GN) soluble bluish red ppt.

16290 C.I. Acid Red 41 (Bright bluish red)

C.I. Food Red 8

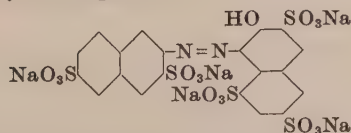


Naphthionic acid → 2-Naphthol-3,6,8-trisulfonic acid

Discoverer — L. Limpach 1882

M.L.B., USP 268506; FP 149249; GP 22038 (Fr. 1, 387)
King, JCS (1929), 608

Soluble in water (magenta red)
Very slightly soluble in ethanol
H₂SO₄ conc. — violet; on dilution — pink
Aqueous solution + HCl conc. — magenta red;
+ NaOH — reddish brown

16295 Dye for Pigments

3-Amino-2,7-naphthalenedisulfonic acid
→ 2-Naphthol-3,6,8-trisulfonic acid

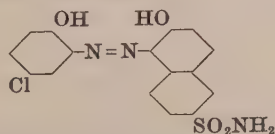
Heliopurpurine GL (By)

Used for manufacture of yellowish red salts, fast to lime and moderately fast to light

Färberztg. 15 (1904), 95
Chem. Tr. J. 33 (1905), 116

16310 Acid Dye

A chromium complex of the monoazo dye



2-Amino-4-chlorophenol → 2-Naphthol-6-sulfonamide;

then convert to the chromium complex containing 1 atom of chromium to 2 mol. monoazo dye

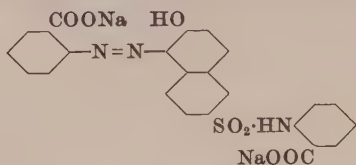
Discoverer — I.G.

Perlon Fast Violet RTS (IG)

For dyeing of "Perlon"

BIOS 961, 95
BIOS MISC 20, 32

16315 C.I. Mordant Red 74 (Dull yellowish red)



Anthranilic acid \rightarrow *N*-(6-Hydroxy-2-naphthylsulfonyl)anthranilic acid

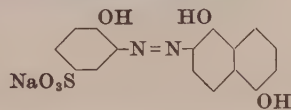
Discoverer — W. Benade 1936

I.G., BP 486865; USP 2122127; FP 815114; GP 673182 (Fr. 25, 658)

FIAT 764 — Saeurealizarinrot BT

Soluble in water and ethanol (golden orange)
 H_2SO_4 conc. — orange; on dilution — golden orange
Aqueous solution + HCl conc. — orange;
+ NaOH conc. — orange

16500 C.I. Mordant Black 9 (Black)



2-Amino-1-phenol-4-sulfonic acid \rightarrow 1,5-Naphthalenediol

HNO_3 conc. — reddish brown, becoming paler
Aqueous solution + HCl conc. — wine red;
+ NaOH conc. — wine red

Discoverer — M. Kahn 1902

Bayer Co., BP 18569/02; USP 722715; FP 323809; GP 157786 (Fr. 7, 411)

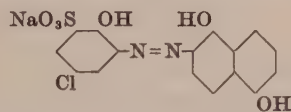
FIAT 764 — Diamantschwarz PV

Fischer & Bauer, *J. prakt. Chem.* **95** (1917), 261

Morgan & Main Smith, *JCS*, **125** (1924), 1733; *JSDC*, **41** (1925), 233

Soluble in water (bordeaux)
Moderately soluble in ethanol and Cellosolve (magenta red)
Slightly soluble in acetone
 H_2SO_4 conc. — violet brown to black; on dilution — wine red

16505 C.I. Mordant Black 7 (Bluish black)



6-Amino-4-chloro-1-phenol-2-sulfonic acid \rightarrow 1,5-Naphthalenediol

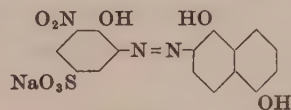
Discoverer — M. Kahn 1902

Bayer Co., BP 18569/02; USP 726695; FP 323809; GP 157786 (Fr. 7, 411)

FIAT 764 — Diamantschwarz PBB

Soluble in water (reddish violet to bordeaux)
Slightly soluble in ethanol and acetone (dark bluish red to magenta)
 H_2SO_4 conc. — violet to bluish black; on dilution — dull wine red
Aqueous solution + HCl conc. — brownish red, ppt;
+ NaOH conc. — violet

16510 C.I. Mordant Black 51 (Black)



2-Amino-6-nitro-1-phenol-4-sulfonic acid \rightarrow 1,5-Naphthalenediol

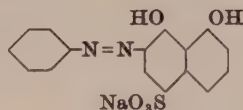
Discoverer — M. Kahn 1902

Bayer Co., BP 18569/02; USP 725848; FP 323809; GP 157786 (Fr. 7, 411)

FIAT 764 — Diamantschwarz SF

Soluble in water (bordeaux)
Moderately soluble in ethanol (orange red brown)
 H_2SO_4 conc. — cloudy violet brown; on dilution — wine red
Aqueous solution + HCl conc. — reddish brown;
+ NaOH conc. — violet

16530 Acid Dye



Aniline \rightarrow 4,5-Dihydroxy-1-naphthalenesulfonic acid

H_2SO_4 conc. — magenta red; on dilution — magenta red
Aqueous solution + HCl conc. — magenta red ppt;
+ NaOH conc. — orange brown

Discoverer — M. Ulrich 1889

Azo Fuchsin GN extra (By)

Dyed on wool in the presence of acid. Fastness to stoving, good

Bayer Co., BP 18517/89; USP 466841, 468142; FP 203744; GP 54116 (Fr. 2, 315)

Coupling of 4,5-Dihydroxy-1-naphthalenesulfonic acid (Dihydroxy S acid):

Bucherer, *J. prakt. Chem.* (2) **70** (1904), 354

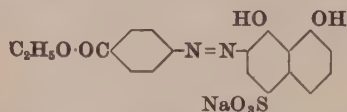
Zollinger & Büchler, *Helv. Chim. Acta*, **34** (1951), 591

Zollinger, *Helv. Chim. Acta*, *Ibid.* 600

For consistency of presentation 4,5-dihydroxy-1-naphthalenesulfonic acid is shown as coupling in position 3. With many diazo components the product is probably a mixture of the 3- and 6- coupled isomers

Soluble in water (bluish red) and ethanol (magenta red)

16535 Acid Dye



Ethyl *p*-Aminobenzoate \rightarrow 4,5-Dihydroxy-1-naphthalenesulfonic acid

Discoverer — M. Ulrich 1889

Azo Fuchsin S (By)

Dyed on wool in the presence of acids

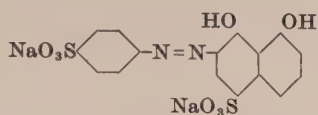
Fastness Properties: Light, good; Stoving, good

Soluble in water (wine red) and ethanol (magenta red)

H_2SO_4 conc. — dark blue; on dilution — dullish pink

Aqueous solution + HCl conc. — wine red ppt;

+ NaOH conc. — reddish violet

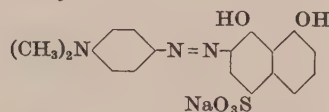
16540 C.I. Acid Red 31 (Bluish red)

Sulfanilic acid → 4,5-Dihydroxy-1-naphthalenesulfonic acid

Discoverer — M. Ulrich 1889

Bayer Co., BP 18517/89; USP 466841, 468142; FP 203744;
GP 54116 (Fr. 2, 315), GP 59594 (Fr. 3, 569)
FIAT 764 — Azofuchsin G

Soluble in water (magenta red)
Very slightly soluble in ethanol
H₂SO₄ conc. — dullish violet; on dilution — magenta red
Aqueous solution + HCl conc. — magenta;
+ NaOH conc. — wine red to bordeaux

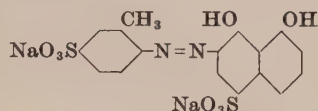
16545 Acid Dye

- (a) *N,N*-Dimethyl-*p*-phenylenediamine
→ 4,5-Dihydroxy-1-naphthalenesulfonic acid; or
(b) *p*-Nitroaniline → 4,5-Dihydroxy-1-naphthalenesulfonic acid;
then reduce the nitro group to amino and methylate

Azo Acid Blue 4B, 6B (By)

Bayer Co., BP 5984/91; USP 567615; FP 212648; GP 77169
(Fr. 3, 1007)
M.L.B., BP 8270/92; FP 221363; GP 70885 (Fr. 3, 958)
Nölting, Ber. 18 (1885), 1144
Ayling, Corvin & Hinkel, JCS (1941), 613 (Diazotisation and coupling of *N,N*-dimethyl-*p*-phenylenediamine)

Soluble in water (violet)
H₂SO₄ conc. — reddish violet; on dilution — red
Aqueous solution + HCl — red; + NaOH — red

16550 Acid Dye

4-Amino-*m*-toluenesulfonic acid
→ 4,5-Dihydroxy-1-naphthalenesulfonic acid

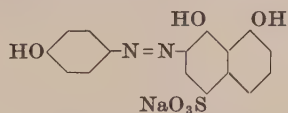
Aqueous solution + HCl conc. — magenta red;
+ NaOH conc. — bordeaux ppt.

Discoverer — M. Ulrich 1889

Azo Fuchsin B (By)

Dyed on wool in the presence of acid giving a magenta red shade converted into violet-black by afterchroming
Fastness Properties: Alkali, moderate; Light, good; Milling, moderate
Note—In C.I.66 (1st Ed.) the constitution of Azo Fuchsin B is shown wrongly as from toluidine
Bayer Co., BP 18517/89; USP 466841, 468142; FP 203744; GP 54116 (Fr. 2, 315)

Soluble in water (magenta to wine red) and ethanol
H₂SO₄ conc. — dullish violet to corinth; on dilution — magenta red

16555 Acid Dye

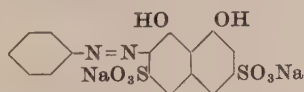
p-Aminophenol → 4,5-Dihydroxy-1-naphthalenesulfonic acid

Discoverers — C. Duisberg and M. Ulrich (Bayer Co.) 1890

Azo Acid Violet 4R (By)

FP 212648

Soluble in water (wine red) and alcohol (reddish violet)
H₂SO₄ conc. — reddish violet; on dilution — ruby red
Aqueous solution + HCl conc. — cherry red;
+ NaOH conc. — orange brown

**16570 C.I. Acid Red 29 (Bright red)
C.I. Mordant Blue 80 (Deep blue)**

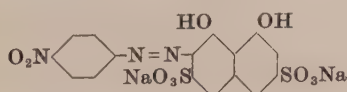
Aniline → Chromotropic acid

HNO₃ conc. — red solution, turning orange
Aqueous solution + HCl conc. — reddish orange;
+ NaOH conc. — magenta red

Discoverer — H. Koch 1890

M.L.B., BP 9258/90; USP 458283; FP 212607; GP 69095
(Fr. 3, 588)
Cassella Co., GP 70345 (Fr. 3, 602)
FIAT 764 — Chromotrop RR
Rosenhauer, Wirth & Königer, Ber. 62 (1929), 2717
Zollinger, Helv. Chim. Acta, 34 (1951), 600

Soluble in water (reddish orange) and Cellosolve
Moderately soluble in ethanol (reddish violet) and acetone
Insoluble in other organic solvents
H₂SO₄ conc. — magenta red; on dilution — pink

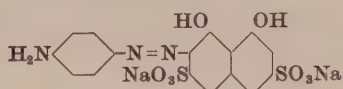
**16575 C.I. Acid Red 176 (Bluish red)
C.I. Mordant Black 93 (Blue→black)**

p-Nitroaniline → Chromotropic acid

Discoverer — H. Kuzel 1890

M.L.B., BP 9258/90; USP 458283; FP 206439, 212607; GP 69095,
(Fr. 3, 588)
Morgan & Main Smith, JSDC, 41 (1925), 233

Soluble in water (yellowish red)
Insoluble in ethanol
H₂SO₄ conc. — dark violet; on dilution — yellowish red solution
Aqueous solution + HCl — yellow; + NaOH — bluish red

16580 C.I. Acid Violet 3 (Bluish violet)

(a) *p*-Nitroaniline → Chromotropic acid (C.I.16575); and reduce the nitro group

(b) *p*-Aminoacetanilide → Chromotropic acid (C.I.16600); and hydrolyse the acetamido group

Aqueous solution + HCl conc. — red;
+ NaOH conc. — reddish orange brown

Discoverer — Otto 1892

M.L.B., BP 8270/92; FP 221363; GP 70885, 73321, (Fr. 3, 598, 601)

FIAT 764 — Viktoriaviolett 4BS

Dubský & Okáč, *Rec. Trav. chim.* **46** (1927), 301

Soluble in water (bluish violet)

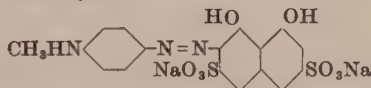
Very slightly soluble in ethanol and Cellosolve

H₂SO₄ conc. — bluish red; on dilution — wine colour

HNO₃ conc. — wine coloured solution

HCl conc. — maroon solution

NaOH 10% — maroon solution

16585 Acid Dye

(a) *p*-Amino-*N*-methylacetanilide → Chromotropic acid; then hydrolyse the acetamido group (GP ap. C10356)

(b) *N*-Methyl-*p*-phenylenediamine → Chromotropic acid; then heat in dilute mineral acid medium to remove the *N*-nitroso group. (Two mol. of nitrous acid are taken up by *N*-methyl-*p*-phenylenediamine with simultaneous nitrosation and diazotisation (GP 154336))

Note — *N*-Methyl-*p*-phenylenediamine can be diazotised without nitrosation (Hodgson & Marsden)

Discoverers — P. Julius, E. Fussenegger, and A. Weinberg 1903

Badische Co., BP 5689/03; USP 754315; FP 338103; GP 154336 (Fr. 7, 367)

Cassella Co., USP 718181; GP ap. C10356 (Fr. 7, 368)

Geigy, GP ap. A8759 (Fr. 7, 368)

BIOS 1548, 64

FIAT 764 — Azosaureblau B

Hantzsch, *Ber.* **35** (1902), 896

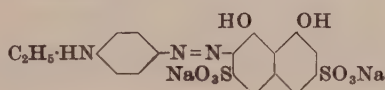
Hodgson & Marsden, *JCS* (1944), 398

Soluble in water (bordeaux) and ethanol (reddish blue)

H₂SO₄ conc. — reddish violet; on dilution — orange red

Aqueous solution + HCl conc. — orange red;

+ NaOH conc. — orange brown

16590 Acid Dye

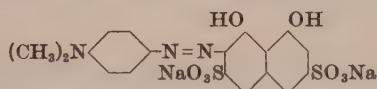
(a) *p*-Amino-*N*-ethylformanilide → Chromotropic acid; then hydrolyse the formamido group

(b) *N*-Ethyl-*p*-phenylenediamine → Chromotropic acid; then heat in dilute mineral acid medium to remove the *N*-nitroso group. (Compare C.I.16585)

Discoverers — P. Julius, E. Fussenegger, and A. Weinberg 1903

Patents as for C.I.16585

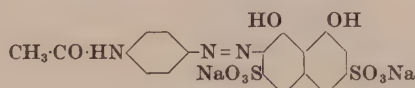
Fierz, *JSCI*, **41** (1922), 517R

16595 C.I. Acid Blue 4 (Reddish blue)

(a) *N,N*-Dimethyl-*p*-phenylenediamine → Chromotropic acid

(b) Dimethylate the amino group in C.I.16580

Bayer Co., GP 77169 (Fr. 3, 1007)

16600 C.I. Acid Violet 6 (Reddish violet)

p-Aminoacetanilide → Chromotropic acid

M.L.B., BP 9258/90, 5904/91; USP 458283; GP 69095, 75738, (Fr. 4, 742, 742)

Soluble in water (maroon) and in Cellosolve

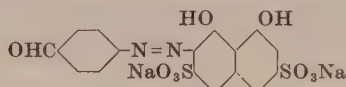
Slightly soluble in ethanol

Insoluble in other organic solvents

H₂SO₄ conc. — maroon; on dilution — crimson, brown ppt.

HNO₃ conc. — pink solution, turns yellow

NaOH 10% — wine coloured solution

16605 C.I. Acid Red 19 (Bright bluish red)

p-Aminobenzaldehyde → Chromotropic acid

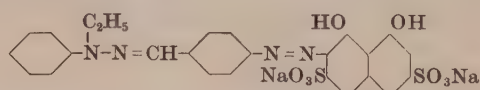
Geigy, BP 13744/96; FP 248517; GP 85233 (Fr. 4, 705)

Soluble in water (red)

H₂SO₄ conc. — blue; on dilution — red

HCl — light red ppt.

NaOH — carmine red solution

16610 Acid Dye

Treat C.I.16605 with 1-Ethyl-1-phenylhydrazine

Chromazone Blue R (Gy)

Dyes wool or chrome-mordanted wool in the presence of acid

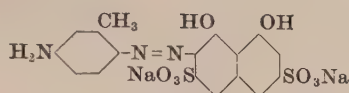
Geigy, BP 13744/96; FP 248517; GP 85233 (Fr. 4, 705)

Soluble in water (bluish violet)

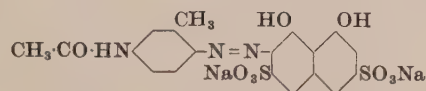
H₂SO₄ conc. — bluish red; on dilution — red solution and ppt.

HCl — red solution with a faint ppt.

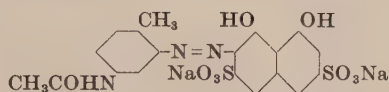
NaOH — purple red solution

16620 Acid Dye

4'-Amino-*m*-acetotoluidide → Chromotropic acid (C.I.16625);
then hydrolyse the acetamido group

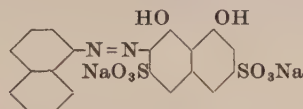
16625 C.I. Acid Violet 20 (Reddish violet)

4'-Amino-*m*-acetotoluidide → Chromotropic acid

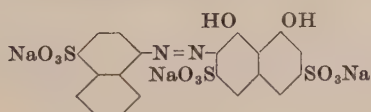
16630 Acid Dye

3'-Amino-*p*-acetotoluidide → Chromotropic acid

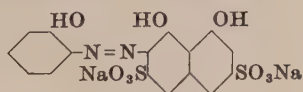
Aqueous solution + HCl conc. — magenta red;
+ NaOH conc. — wine red

16640 C.I. Acid Violet 13 (Bright reddish violet)

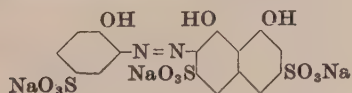
1-Naphthylamine → Chromotropic acid

**16645 C.I. Acid Red 60 (Bluish red)
C.I. Mordant Blue 81 (Bluish black)**

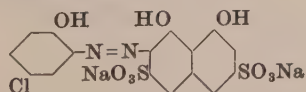
Naphthionic acid → Chromotropic acid

16670 Mordant Dye (Dull reddish navy)

o-Aminophenol → Chromotropic acid

16675 C.I. Mordant Blue 31 (Reddish navy)

2-Amino-1-phenol-4-sulfonic acid → Chromotropic acid

16680 C.I. Mordant Blue 13 (Navy)

2-Amino-4-chlorophenol → Chromotropic acid

Aqueous solution + HCl conc. — magenta red;
+ NaOH conc. — bluish violet

Brilliant Naphthol Blue R (MLB)

Dyed on wool in the presence of acid. Fastness to light, moderate

Dyes of similar constitution —

M.L.B., BP 8270/92; FP 221363; GP 70885, 73321, (Fr. 3, 598, 601)

FIAT 764 — Brillantnaphtholblau R

Soluble in water (reddish blue) and ethanol
H₂SO₄ conc. — orange brown; on dilution — weak greyish violet
Aqueous solution + HCl conc. — much paler (weak greyish blue);
+ NaOH conc. — much paler (weak violet blue)

M.L.B., GP 73321 (Fr. 3, 601), 75738, 77551, (Fr. 4, 742, 744)
FIAT 764 — Azowollviolett 7R

Soluble in water (reddish violet)
Slightly soluble in ethanol
H₂SO₄ conc. — violet; on dilution — magenta red
Aqueous solution + HCl conc. — reddish violet;
+ NaOH conc. — wine red

Brilliant Lanafuchsin BB (MLB)

Dyes wool in the presence of sulfuric acid. Levelling, good
Fastness Properties: Light, moderate; Milling (alkaline), poor;
Perspiration, moderate; Washing, moderate

M.L.B., GP 77551 (Fr. 4, 744)

FIAT 764 — Brillantlanafuchsin BB

Soluble in water (magenta red)
Soluble in ethanol (rubine)
H₂SO₄ conc. — reddish violet; on dilution — magenta red

M.L.B., BP 9258/90; USP 458283; FP 206439, 212607; GP 69095
(Fr. 3, 588)

Soluble in water (violet) and ethanol
H₂SO₄ conc. — greenish blue; on dilution — reddish violet
Aqueous solution + HCl conc. — bluer;
+ NaOH conc. — yellowish red

Discoverer — H. Kuzel 1890

M.L.B., BP 9258/90; USP 458283; FP 212607; GP 69095
(Fr. 3, 585)

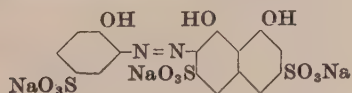
Soluble in water (magenta red)
Slightly soluble in ethanol (pink)
H₂SO₄ conc. — blue (+ magenta red); on dilution — pink
Aqueous solution + HCl conc. — magenta red;
+ NaOH conc. — violet

Discoverers — K. Schirmacher and F. Schmidt 1905

Fast Mordant Blue R (MLB)

An afterchrome dye of very good fastness to light and wet processing. Also used in printing on wool with a chromium mordant

M.L.B., BP 26380/05; USP 826279-92; GP 175827 (Fr. 8, 612)

16675 C.I. Mordant Blue 31 (Reddish navy)

2-Amino-1-phenol-4-sulfonic acid → Chromotropic acid

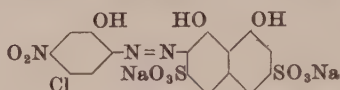
Soluble in water and ethanol
H₂SO₄ conc. — violet; on dilution — bluish pink
HNO₃ conc. — dull orange to yellowish brown
NaOH — blue solution

Discoverers — K. Schirmacher and F. Schmidt 1905

M.L.B., BP 26383/05; USP 826280; FP 361649; GP 168610, 175827, 178304, (Fr. 8, 611, 612, 615)

FIAT 764 — Echtbeizenblau B

Soluble in water (magenta red) and Cellosolve
Moderately soluble in ethanol
H₂SO₄ conc. — deep blue; on dilution — magenta red
HNO₃ conc. — brownish red solution
NaOH — reddish blue solution

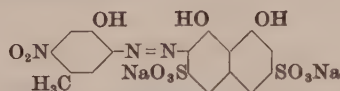
16685 C.I. Mordant Blue 54 (Dull greenish blue)

2-Amino-4-chloro-5-nitrophenol → Chromotropic acid

Discoverer — Bayer Co. 1905

Bayer Co., BP 9264/06; FP 365415; GP 186655 (Fr. 8, 602)
M.L.B., FP 361649; GP 184689, 188819, GP ap. F21397, (Fr. 8, 614, 616, 617)

FIAT 764 — Saeurechromblau 3G

Soluble in water (violet)
Slightly soluble in ethanol
H₂SO₄ conc. — blue to black; on dilution — pink to violet
Aqueous solution + HCl conc. — magenta red;
+ NaOH conc. — reddish blue**16690 Mordant Dye**2-Amino-5-nitro-*p*-cresol → Chromotropic acidH₂SO₄ conc. — deep bluish violet; on dilution — magenta red
Aqueous solution + HCl conc. — magenta red;
+ NaOH conc. — reddish blue

Discoverer — M.L.B. 1905

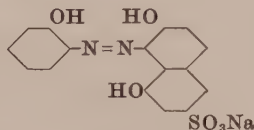
Acid Chrome Blue BG (By)Afterchrome dye Fastness (C): Alkali 4, Acid Boiling 2,
Carbonising 5, Decatising 4-5, Light 6, Milling (alkaline)
5, 5, 5, Perspiration 5, Peroxide bleaching 1, Potting 4,
Sea Water 5, Stoving 5, Washing 5, 5, 5

M.L.B., BP 26383/05; FP 361649; GP 184689, 188819, (Fr. 8, 614, 616); GP ap. F21397 (Fr. 8, 617)

Literature (Application), I.G. Wool Man. 67, 850

Soluble in water (blue)
Insoluble in ethanol**16700 Acid Dye (Bluish grey)***

A chromium complex of the monoazo dye

*o*-Anisidine → 4,6-Dihydroxy-2-naphthalenesulfonic acid
then heat with chromium sulfate in acid aqueous solution for 1 hr. at 125°C
and 3½ hr. at 130°C to form the chromium complex

* On leather

Discoverers — F. Lange and H. Krzikalla 1933

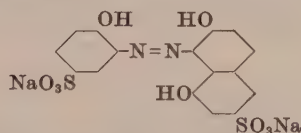
Erganil Grey BC (IG)

Leather dye

I.G., BP 395968; USP 1978880; FP 638772; GP 584645 (Fr. 20, 1165)

FIAT 764 — Erganilgrau BC

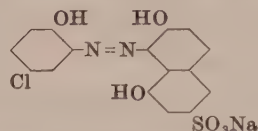
Coupling of 4,6-dihydroxy-2-naphthalenesulfonic acid ("Di-hydroxy Gamma acid"):

Zollinger, *Helv. Chim. Acta*, **33** (1950), 538; **34** (1951), 600Zollinger & Büchler, *Ibid.* **34** (1951), 591**16705 Mordant Dye**2-Amino-1-phenol-4-sulfonic acid
→ 4,6-Dihydroxy-2-naphthalenesulfonic acid

Discoverer — Cassella Co. 1889

Anthracene Chrome Black AP (IG)

FIAT 764 — Anthracenchromschwarz AP

Soluble in water (scarlet)
Very slightly soluble in ethanol (pale brownish pink)
H₂SO₄ conc. — corinth; on dilution — pink
Aqueous solution + HCl conc. — scarlet;
+ NaOH conc. — violet black**16710 C.I. Mordant Black 56 (Bluish grey → Greenish black)**2-Amino-4-chlorophenol → 4,6-Dihydroxy-2-naphthalenesulfonic acid
2-Naphthalenesulfonic acid is added to the diazo solution; the coupling is carried out in the presence of Ca(OH)₂

Discoverers — K. Wiedemann, H. Clingstein, H. Krzikalla, and W. Kühne 1932

I.G., BP 421421; FP 757084; GP 589842 (Fr. 20, 1192)

For preparation method see —

FIAT 764 — Palatinechtblauschwarz BN

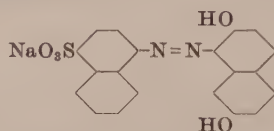
Soluble in water (violet)
H₂SO₄ conc. — bluish black; on dilution — reddish violet
HCl conc. — violet solution
NaOH — reddish violet solution**16711 C.I. Acid Black 51 (Black)**

A chromium complex of C.I.16710

Heat C.I.16710 with aqueous chromium formate for 4½ hr. at 115°C

For discoverers and patents see C.I.16710

FIAT 764 — Palatinechtblauschwarz BN

16720 Acid Dye

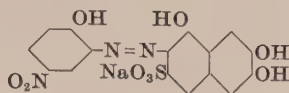
Naphthionic acid → 2,7-Naphthalenediol

Discoverers — Durand and Huguenin 1899

Roxamine (DH)

Dyes wool in the presence of acid

Soluble in water (scarlet)
H₂SO₄ conc. — intense violet; on dilution — scarlet
Aqueous solution + HCl — unaltered;
+ NaOH conc. — darker

16730 Mordant Dye

2-Amino-4-nitrophenol
→ 4,6,7-Trihydroxy-2-naphthalenesulfonic acid

Discoverer — Cassella Co.

Anthracene Chrome Black P (C)

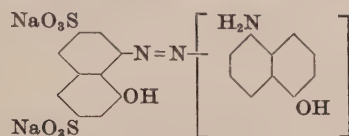
FIAT 764 — Anthracenchromschwarz P

Soluble in water (orange brown)

Very slightly soluble in ethanol

H₂SO₄ conc. — violet; on dilution — orange

Aqueous solution + HCl conc. — orange brown;
+ NaOH conc. — bordeaux

17000 C.I. Acid Blue 70 (Greenish blue)

H acid → (acetic acid)5-Amino-1-naphthol

(Coupling in *o*-position to the NH₂ group would be expected but the actual position seems uncertain)

Cassella Co., BP 24134/96; FP 260848; GP 95190 (Fr. 4, 716)

FIAT 764 — Lanacylblau BB

JSDC, 13 (1897), 186

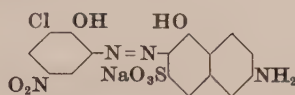
Bucherer, *J. prakt. Chem.* (2) 70 (1904), 355

Soluble in water (violet)

H₂SO₄ conc. — blue; on dilution — unaltered at first, then violet

Aqueous solution + HCl — little change;

+ NaOH — orange red

17005 Mordant Dye

2-Amino-6-chloro-4-nitrophenol → (alk.) J acid

Discoverer — Bayer Co.

Acid Chrome Black MN (By)

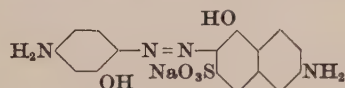
Soluble in water (magenta red)

Moderately soluble in ethanol (red)

H₂SO₄ conc. — cherry red; on dilution — orange

Aqueous solution + HCl conc. — orange, ppt;

+ NaOH conc. — orange red brown

17010 Mordant Dye (Black)

2-Amino-5-nitrophenol → J acid;

then reduce the nitro group to an amino group with sodium sulfide

Discoverer — W. Kirst 1939

Autazol Chrome Black R (IG)

Gives solid deep black on mixtures of wool and viscose

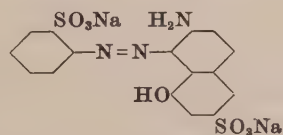
Autazol Chrome Salt R (IG)

Mixture of metal salts for the aftertreatment of dyeings of Autazol Chrome Black R

I.G., GP 709723 (Fr.-Bayer, I-1, 1261)

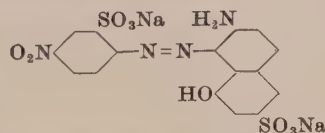
BIOS MISC. 20, Appendix 63

FIAT 764 — Autazolchromschwarz R

17020 C.I. Acid Red 54 (Bright yellowish red)

o-Aminobenzenesulfonic acid → (acid) Gamma acid

M.L.B., FP 468218

17025 C.I. Acid Violet 1 (Violet)

2-Amino-5-nitrobenzenesulfonic acid → (acid) Gamma acid

Discoverers — O. Günther and L. Hesse 1908

Bayer Co., FP 396949; GP 220532 (Fr. 10, 832)

BIOS 1548, 62

FIAT 764 — Viktoriaechtviolett RR

Soluble in water (reddish violet), ethanol (reddish violet) and cellosolve

Slightly soluble in acetone and benzene

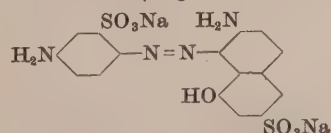
Insoluble in other organic solvents

H₂SO₄ conc. — orange brown; on dilution — violet

HNO₃ conc. — red solution, turns brown

Aqueous solution + HCl conc. — bordeaux;

+ NaOH conc. — blue

17030 C.I. Acid Red 34 (Bright bluish red)

Reduce the nitro group in C.I.17025 to an amino group with sodium sulfide

Soluble in water (bluish red to violet) and Cellosolve

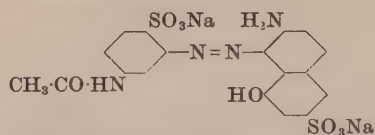
Slightly soluble in ethanol

Insoluble in other organic solvents

H₂SO₄ conc. — orange red; on dilution — orange red

Aqueous solution + H₂SO₄ 10% — weaker red;

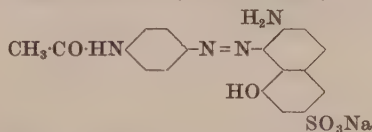
+ NaOH 10% — weaker red

17035 C.I. Acid Red 30 (Red)

4-Acetamido-2-aminobenzenesulfonic acid → (acid) Gamma acid

Bayer Co., *GP* 298340 (*Fr.* 13, 488)
BIOS 1548, 49
FIAT 764 — Anthralanrot 2G, Echtlichtrot G

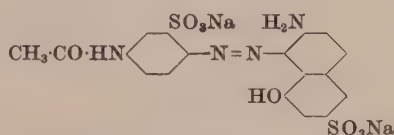
Soluble in water (red)
 Very slightly soluble in ethanol and acetone
 H_2SO_4 conc. — orange brown to brownish red; on dilution — salmon colour
 Aqueous solution + HCl conc. — red, ppt;
 + NaOH conc. — bordeaux

17040 C.I. Acid Red 231 (Dull bluish red)*

p-Aminoacetanilide → (acid) Gamma acid

* On leather

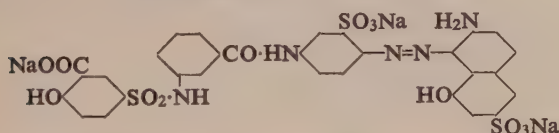
Soluble in water (orange)
 H_2SO_4 conc. — reddish violet; on dilution — bluish red
 Aqueous solution + HCl conc. — reddish brown ppt;
 + NaOH conc. — unaltered

17045 C.I. Acid Red 37 (Bluish red)

5-Acetamido-2-aminobenzenesulfonic acid → (acid) Gamma acid

Discoverer — M.L.B.
BIOS 1548, 48
FIAT 764 — Anthralanrot G, Echtlichtrot B

Soluble in water (cherry red)
 Slightly soluble in ethanol (magenta red)
 H_2SO_4 conc. — dull bluish red; on dilution — dark red to reddish violet
 HNO_3 conc. — olive green, quickly changing to brown
 HCl conc. — reddish violet ppt. soluble on dilution
 Aqueous solution + HCl conc. — bordeaux ppt;
 + NaOH conc. — wine red

17047 C.I. Mordant Red 90 (Bright bluish red)

5-[*m*-(4-amino-3-sulfophenylcarbamoyl)phenylsulfamoyl] salicylic acid → (acid) Gamma acid

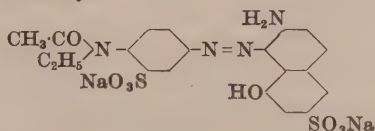
Discoverer — R. Fleischhauer 1934
Supramine Red BLL (IG)

Dyes wool in the presence of acetic acid and silk in boiled off liquor broken with acetic acid

Fastness Properties: Light, good; Milling, moderate; Perspiration, moderate to good; Washing, moderate to good

I.G. *BP* 447522; *USP* 2065680; *FP* 792319; *GP* 633835 (*Fr.* 23, 781)

FIAT 764 — Supraminrot BLL

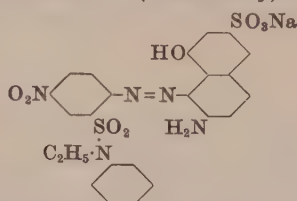
17050 Acid Dye

5-Amino-2-(*N*-ethylacetamido)benzenesulfonic acid
 → (acid) Gamma acid

H_2SO_4 conc. — reddish orange to brown; on dilution — reddish orange

Aqueous solution + HCl conc. — orange red;
 + NaOH conc. — bordeaux

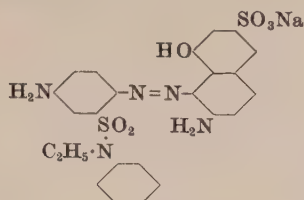
Soluble in water (orange)
 Moderately soluble in ethanol (red)

17055 C.I. Acid Blue 117 (Reddish navy)

2-Amino-*N*-ethyl-5-nitrobenzenesulfonanilide → (acid) Gamma acid

Discoverer — H. Schweitzer 1916
 Bayer Co. *BP* 164218; *USP* 1429781-2; *FP* 515442; *GP* 298432 (*Fr.* 13, 490)
FIAT 764 — Supraminblau R

Soluble in water (deep violet) and ethanol (violet blue)
 H_2SO_4 conc. — yellowish brown; on dilution — violet
 Aqueous solution + HCl conc. — dullish violet;
 + NaOH conc. — blue

17060 C.I. Acid Violet 11 (Dull reddish violet)

Reduce the nitro group in C.I.17055 to an amino group with sodium sulfide

Discoverer — H. Schweitzer 1916

Bayer Co., BP 164218; FP 515442; GP 305522 (Fr. 13, 491)

BIOS 1548, 61

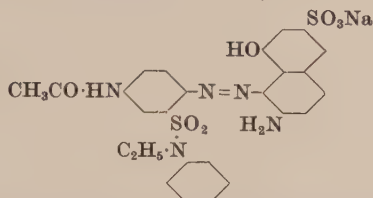
FIAT 764 — Supraminbordo B

Soluble in water and ethanol (magenta red)

H₂SO₄ conc. — yellowish brown; on dilution — pink

Aqueous solution + HCl conc. — red;

+ NaOH conc. — ruby

17065 C.I. Acid Red 32 (Bluish red)

Acetylate the amino group (*p*- to the azo group) in C.I.17060

Discoverers — H. Clingstein, P. Zervas, and H. Schweitzer 1929

I.G., BP 341397; USP 1840385; FP 696873; GP 608860 (Fr. 20, 1155)

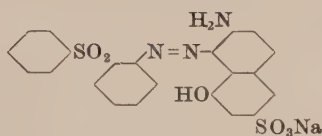
FIAT 764 — Anthralanbordo B, Echtlichtrubin BL

Soluble in water (red) and ethanol (magenta red)

H₂SO₄ conc. — corinth; on dilution — orange

Aqueous solution + HCl conc. — red;

+ NaOH conc. — violet

17070 C.I. Acid Red 42 (Bluish red)

o-(Phenylsulfonyl)aniline → (acid) Gamma acid

Discoverer — E. Fischer 1932

I.G., BP 399916; USP 1980515; FP 755074; GP 610067 (Fr. 21, 887)

BIOS 1548, 47

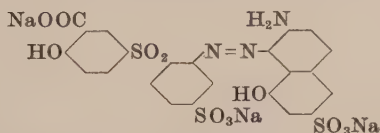
FIAT 764 — Anthralanrot B

Soluble in water (red) and ethanol (magenta red)

H₂SO₄ conc. — dullish violet; on dilution — orange

Aqueous solution + HCl conc. — reddish brown, ppt;

+ NaOH conc. — bordeaux ppt.

17075 C.I. Mordant Red 26 (Bright bluish red)

5-(2-Amino-4-sulfophenylsulfonyl)salicylic acid
→ (acid) Gamma acid

Discoverer — K. H. Saunders 1924

Brit. Dye. Corp., BP 245865; USP 1766946; GP 580797 (Fr. 19, 1725)

FIAT 764 — Diamantrot 3B

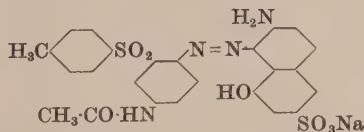
Soluble in water (red)

Slightly soluble in ethanol (magenta red)

H₂SO₄ conc. — orange brown; on dilution — pink

Aqueous solution + HCl conc. — red;

+ NaOH conc. — violet

17080 C.I. Acid Violet 14 (Reddish violet)

4-Amino-3'-(*p*-tolylsulfonyl)acetanilide → (acid) Gamma acid

Ciba, Sw.P 90839-41; GP 365617 (Fr. 14, 960)

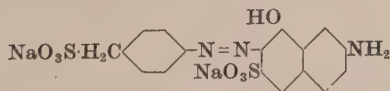
Soluble in water (red)

Slightly soluble in ethanol and acetone

H₂SO₄ conc. — dark bluish red; on dilution — bluish red

Aqueous solution + H₂SO₄ 10% — slightly paler;

+ NaOH 10% — slightly paler

17100 C.I. Acid Brown 90 (Reddish brown)*

p-Amino-*o*-toluenesulfonic acid → (alk.) Gamma acid

* On leather

Discoverers — E. Fischer, W. Gmelin, R. Huss, and W. Pense

I.G., GP 708435 (Fr.-Bayer, I-1, 495)

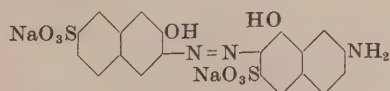
FIAT 764 — Igenalbraun PRF

Soluble in water (reddish orange brown)

H₂SO₄ conc. — red; on dilution — orange

Aqueous solution + HCl conc. — orange;

+ NaOH conc. — orange brown

17105 Mordant Dye

3-Amino-2-naphthol-7-sulfonic acid → (alk.) Gamma acid

Discoverer — A. Weinberg 1897

Anthracene Chrome Black RMG (IG)

FIAT 764 — Anthracenchromschwarz RMG

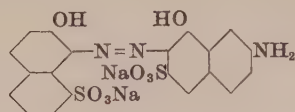
Cassella Co., BP 28107/97; FP 272620-1; GP 109932 (Fr. 5, 521)

Agfa, GP 126597 (Fr. 6, 932)

C.I.206 (1st Ed.) — The correct constitutions of Anthracene Chrome Blacks P and 5B are given under C.I.16730 and 17135

17110

Acid Dye



1-Amino-2-naphthol-8-sulfonic acid → (alk.) Gamma acid

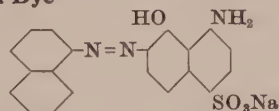
Ponceau 3R (By)

Dyes wool in the presence of acid
Stiegler, *Ind. Eng. Chem.* **10** (1918), 600

Soluble in water and ethanol (magenta)
H₂SO₄ conc. — bluish red; on dilution — reddish brown
Aqueous solution + HCl — darker;
+ NaOH — brown (on filter paper a brown spot which develops a cherry red rim)

17120

Acid Dye



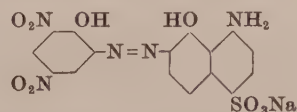
1-Naphthylamine → (alk.) S acid

Wool Black Blue (A)

FIAT 764 — Wollschwarzblau

17125

C.I. Mordant Green 14 (Dull green)



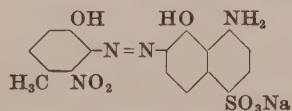
Picramic acid → (alk.) S acid

FIAT 764 — Cypergruen B

Soluble in water (violet)
H₂SO₄ conc. — reddish violet; on dilution — violet brown ppt.
NaOH — brownish blue solution

17130

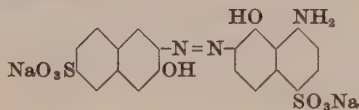
C.I. Mordant Green 30 (Bluish green)

2-Amino-3-nitro-*p*-cresol → (alk.) S acid

Discoverer — B. Richard (Geigy Co.)

17135

Mordant Dye



3-Amino-2-naphthol-7-sulfonic acid → (alk.) S acid

Discoverer — A. Weinberg 1897

Anthracene Chrome Black 5B (C)

An afterchrome dye of properties similar to Mordant Black

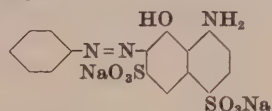
FIAT 764 — Anthracenchromschwarz 5B

Cassella Co., *BP* 28107/97; *FP* 272620-1; *GP* 109932 (*Fr.* **5**, 521)
Agfa, *GP* 126597 (*Fr.* **6**, 932)
Soluble in water (reddish violet)
Very slightly soluble in ethanol
H₂SO₄ conc. — dark corinth; on dilution — magenta red

Aqueous solution + HCl conc. — wine red;
+ NaOH conc. — violet

17150

Acid Dye



Aniline → (alk.) K acid

Discoverers — J. Rosenberg and F. Kreke 1893

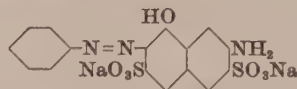
Tolane Red B (or G) (K)

Dyes wool in presence of acid, moderately fast to milling
Kalle Co., *BP* 515/94; *USP* 563383; *GP* 99164 (*Fr.* **5**, 498)

Soluble in water (magenta red)
Insoluble in ethanol
H₂SO₄ conc. — magenta red; on dilution — yellowish brown
Aqueous solution + HCl — yellowish brown solution or ppt;
+ NaOH conc. — orange red

17160

Acid Dye



Aniline → (alk.) 2R acid

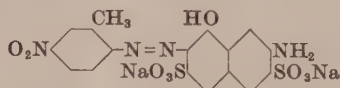
Azo Orseille R (A)

Dyes wool in presence of acid, good fastness to light
Agfa (1893), *GP* ap. A3710 (*Fr.* **4**, 768)
M.L.B., *GP* 53023 (*Fr.* **2**, 383)

Soluble in water and ethanol (yellowish red)
H₂SO₄ conc. — yellowish red; on dilution — orange yellow ppt.
Aqueous solution + HCl conc. — yellowish brown ppt;
+ NaOH conc. — yellower

17165

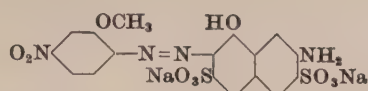
C.I. Acid Brown 9 (Brown)

4-Nitro-*o*-toluidine → (alk.) 2R acid

Discoverer — Agfa 1912

Guinea Brown R, RD (IG)

FIAT 764 — Guineabraun R, RD

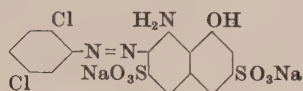
17170 Acid Dye

4-Nitro-*o*-anisidine → (*alk.*) 2R acid

Discoverer — Agfa 1912

Guinea Brown 2R (A)

FIAT 764 — Guineabrown 2R

17180 Direct Dye

2,5-Dichloroaniline → (*acid*) H acid

Discoverer — Schraube 1896

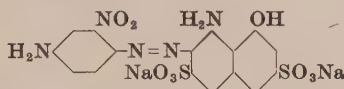
Nigrophor BASF (B)

For the production of "insoluble" azo colours in textile printing cotton is padded or printed with an aqueous solution of Nigrophor BASF, sodium hydroxide and *p*-nitrophenylnitrosamine, dried, exposed to air for 12 hours then rinsed and soaped (cf. GP 116676). Diazotised 1-naphthylamine may be used in place of *p*-nitrophenylnitrosamine

The greenish blacks obtained are claimed to be of good fastness to soaping and of excellent fastness to acids and chlorine

Badische Co., BP 1002/95; FP 244224, 245211; GP 116676 (Fr. 6, 935)

Z. Farb. u. Textilchem. 2 (1903), 26

17185 C.I. Acid Blue 6 (Navy)

4'-Amino-3'-nitroacetanilide → (*acid*) H acid;
then hydrolyse the acetamido group

Discoverer — M. Herzberg 1904

Bayer Co., BP 24045/04; USP 792033; FP 347655; GP 172168 (Fr. 8, 568), 211966 (Fr. 9, 318)

FIAT 764 — Kashmirblau TG ex.

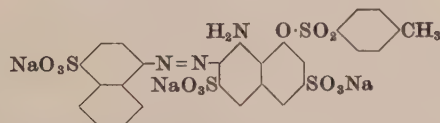
Soluble in water (dark violet)

Slightly soluble in ethanol (dark navy blue)

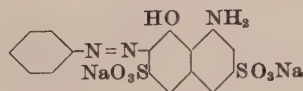
H₂SO₄ conc. — dark blue; on dilution — red

Aqueous solution + HCl conc. — red;

+ NaOH conc. — navy blue

17190 C.I. Acid Violet 2 (Bright reddish violet)

Naphthionic acid → (*acid*) H acid;
then esterify with *p*-toluenesulfonyl chloride

**17200 C.I. Acid Red 33 (Bright red)
C.I. Food Red 12 (Bluish red)**

Aniline → (*alk.*) H acid

Bayer Co., BP 13443/90; FP 210033; GP 62368 (Fr. 3, 606)
Cassella Co., GP 70031 (Fr. 3, 605)

Soluble in water

Slightly soluble in ethanol (magenta red)

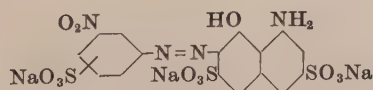
H₂SO₄ conc. — magenta red; on dilution — orange red

HNO₃ conc. — brownish maroon solution

Aqueous solution + HCl conc. — red;

+ NaOH conc. — reddish brown;

+ NaOH dil. — brick red

17205 Acid Dye

Aminonitrobenzenesulfonic acid → (*alk.*) H acid

Discoverer — M.L.B. 1895

Alkali Fast Red B, BB, R (MLB)

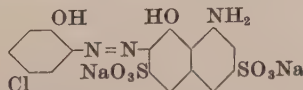
Erdmann, Chem. Ind. (1896), 594

Soluble in water (carmines) and ethanol (bluish red)

H₂SO₄ conc. — yellowish brown; on dilution — cherry red

Aqueous solution + HCl — yellowish red;

+ NaOH — reddish violet

17220 C.I. Mordant Green 28 (Dull bluish green)

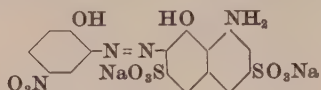
2-Amino-4-chlorophenol → (*alk.*) H acid

Soluble in water (crimson)

H₂SO₄ conc. — reddish blue; on dilution — crimson

NaOH 10% — reddish violet solution

Aqueous solution + HCl — brownish red ppt.

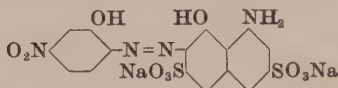
17225 C.I. Mordant Green 17 (Dull bluish green)

2-Amino-4-nitrophenol → (alk.) H acid

Discoverer — Badische Co. 1912

Badische Co., BP 26460/12; USP 1213608; FP 451503;
GP 282987 (Fr. 11, 201)

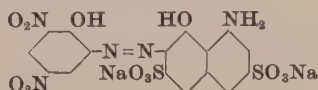
FIAT 764 — Diamantgruen 3G

Soluble in water (reddish violet)
Very slightly soluble in ethanol
H₂SO₄ conc. — violet; on dilution — pink
Aqueous solution + HCl conc. — red;
+ NaOH conc. — violet**17230 Mordant Dye (Dull bluish green)**

2-Amino-5-nitrophenol → (alk.) H acid

Chrome Fast Green G (IG)

Very similar in dyeing properties to Mordant Green 9

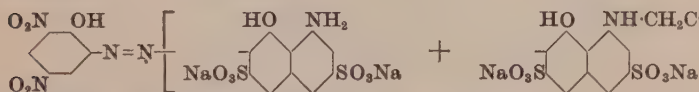
17235 C.I. Mordant Green 36 (Dull green)

Picramic acid → (alk.) H acid

Discoverer — K. Schirmacher 1898

M.L.B., BP 11437/98; USP 627783; FP 278116; GP 112280
(Fr. 5, 523)

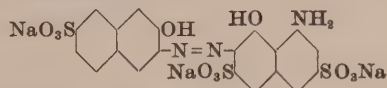
FIAT 764 — Blauschwarz HF

Soluble in water (violet)
Insoluble in alcohol
H₂SO₄ conc. — red; on dilution — violet, then bluish red ppt.
Aqueous solution + HCl conc. — magenta red;
+ NaOH conc. — violet**17236 Acid Dye**Picramic acid → (alk.) mixture of H acid (0.5 mol.)
+ H acid glycine (0.5 mol.)

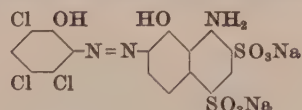
Discoverer — Bayer Co. 1902

Acid Black MF (By) — used only in mixtures

FIAT 764 — Saeureschwarz MF

Soluble in water (dark violet)
Slightly soluble in ethanol
H₂SO₄ conc. — red; on dilution — pink
Aqueous solution + HCl conc. — wine red;
+ NaOH conc. — dullish dark violet**17240 Mordant Dye**

3-Amino-2-naphthol-7-sulfonic acid → (alk.) H acid

Anthracene Chrome Blue H (C)Cassella Co., BP 28107/97; FP 272620-1; GP 109932 (Fr. 5, 521)
Agfa, GP 126597 (Fr. 6, 932)Soluble in water (magenta red to violet)
Very slightly soluble in ethanol (pink)
H₂SO₄ conc. — violet; on dilution — magenta red
Aqueous solution + HCl conc. — magenta red;
+ NaOH conc. — deep violet**17250 C.I. Mordant Blue 44 (Greenish navy)**

2-Amino-3,4,6-trichlorophenol → Chicago acid

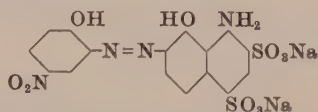
Discoverers — W. Herzberg and O. Scharfenberg 1920

Agfa, USP 1426189-90; GP 364829 (Fr. 14, 979)

FIAT 764 — Chromechtblau FB

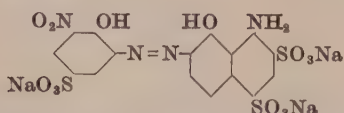
Soluble in water and ethanol (dark reddish blue)
H₂SO₄ conc. — bluish grey; on dilution — dark violet ppt.
Aqueous solution + HCl — brown ppt;
+ NaOH — bluish red**17255 C.I. Acid Blue 42 (Reddish navy)**

A copper complex of the monoazo dye

2-Amino-4-nitrophenol → Chicago acid;
then treat with copper sulfate to form the copper complex

Cassella Co., BP 4677/00

FIAT 764 — Periwollblau B

Soluble in water (reddish violet)
Almost insoluble in ethanol
H₂SO₄ conc. — reddish violet (+ some scarlet); on dilution — magenta red
Aqueous solution + HCl conc. — ruby red;
+ NaOH conc. — violet**17260 Acid Dye**

2-Amino-6-nitro-1-phenol-4-sulfonic acid → Chicago acid

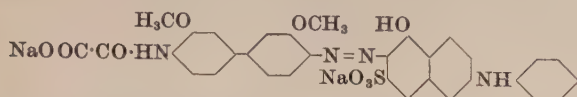
Discoverer — Cassella Co.

Dyes of similar constitution —

Agfa, GP 144618, 148198, (Fr. 7, 376-7)

FIAT 764 — Periwollblau G

Soluble in water (violet)
Very slightly soluble in ethanol
H₂SO₄ conc. — bordeaux; on dilution — magenta red
Aqueous solution + HCl conc. — ruby red;
+ NaOH conc. — bluish violet

17500 C.I. Direct Violet 8 (Bright violet)

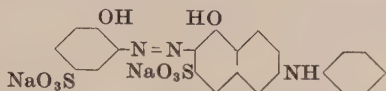
4-(4-Amino-3-methoxyphenyl)-2-methoxyxanilic acid
→ *N*-Phenyl J acid

Discoverer — R. Kothe 1896
Bayer Co., GP 95060 (*Fr.* 4, 71)
FIAT 764 — Brillantbenzoviolett RR

Soluble in water (reddish violet) and ethanol (magenta red)
H₂SO₄ conc. — blue; on dilution — violet
Aqueous solution + HCl conc. — violet ppt;
+ NaOH conc. — bordeaux ppt.

17510 C.I. Direct Violet 56 (Violet)

A copper complex derived from

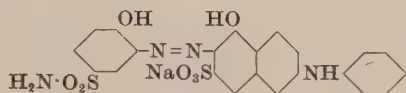


2-Amino-1-phenol-4-sulfonic acid → (*alk.*) *N*-Phenyl J acid;
then convert to the copper complex

Soluble in water
Slightly soluble in ethanol
HCl conc. — scarlet
HNO₃ conc. — orange yellow

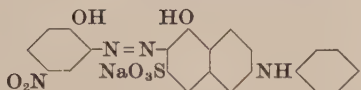
17515 C.I. Direct Violet 46 (Bright reddish violet)

A copper complex derived from



2-Amino-1-phenol-4-sulfonamide → (*alk.*) *N*-Phenyl J acid;
then convert to the copper complex

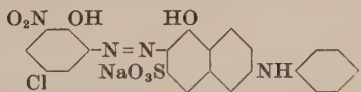
Soluble in water (violet)
H₂SO₄ conc. — reddish violet; on dilution — reddish purple
Aqueous solution + HCl — reddish violet; + NaOH — redder

17520 C.I. Mordant Black 52 (Bluish black)

2-Amino-4-nitrophenol → (*alk.*) *N*-Phenyl J acid

Bayer Co., FP 367504; GP 220392 (*Fr.* 9, 1187)
FIAT 764 — Diamantblauschwarz R

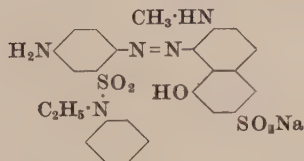
Soluble in water (magenta red)
Moderately soluble in ethanol (orange brown)
H₂SO₄ conc. — magenta red; on dilution — reddish brown
Aqueous solution + HCl conc. — bordeaux ppt;
+ NaOH conc. — brownish magenta red

17525 C.I. Mordant Black 66 (Bluish grey → Bluish black)

2-Amino-4-chloro-6-nitrophenol → (*alk.*) *N*-Phenyl J acid

Discoverers — R. Kothe and M. Kahn 1905
Bayer Co., BP 14921/06; USP 843149; FP 367504; GP 220392
(*Fr.* 9, 1187)
BIOS 1548, 94. FIAT 764 — Diamantblauschwarz BR

Soluble in water (dark violet)
Soluble in ethanol (dark violet)
H₂SO₄ conc. — violet; on dilution — reddish brown
Aqueous solution + HCl conc. — bordeaux;
+ NaOH conc. — dark violet

17540 Acid Dye

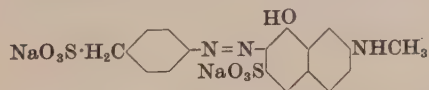
2-Amino-*N*-ethyl-5-nitrobenzenesulfonamide
→ (*acid*) *N*-Methyl Gamma acid;
then reduce the nitro group to an amino group

Discoverer — H. Schweitzer 1916

Supramine Violet B (By)

Dyes wool in the presence of sulfuric acid
Fastness Properties (C): Light 4-5, Milling 3,
Perspiration 4, Washing 3
Bayer Co., BP 164218; FP 515442; GP 305522 (*Fr.* 13, 491)

Moderately soluble in water (ruby)
Soluble in ethanol (reddish violet)
H₂SO₄ conc. — yellowish brown; on dilution — pink
Aqueous solution + HCl conc. — magenta red;
+ NaOH conc. — violet

17550 C.I. Acid Brown 91 (Dull brown)*

p-Amino- α -toluenesulfonic acid → (*alk.*) *N*-Methyl Gamma acid

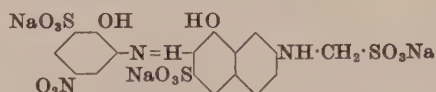
Discoverers — E. Fischer, R. Huss, W. Gmelin, and W. Pense
I.G., GP 708435 (*Fr.*-Bayer, I-1, 495)
FIAT 764 — Igenalbraun PTF

Soluble in water and ethanol (brown)
H₂SO₄ conc. — dullish orange red; on dilution — brownish
orange
Aqueous solution + HCl conc. — olive brown;
+ NaOH conc. — reddish brown to wine red

* On leather

17560 C.I. Acid Black 84 (Grey)

A chromium complex derived from



6-Amino-4-nitro-1-phenol-2-sulfonic acid

→ (alk.) 7-(Sulfomethylamino)-1-naphthol-3-sulfonic acid

then heat in aqueous solution with chromium fluoride for 8 hr. at 97°C to form the chromium complex

I.G., GP 719717 (Fr.-Bayer, I-1, 851)

BIOS MISC 20, Appendix 74

FIAT 764 — Erganilgrau GC

17570 C.I. Acid Brown 89 (Dull brown)*

o-Anisidine → (alk.) 7-(2-Sulfoethylamino)-1-naphthol-3-sulfonic acid

* On leather

Discoverers — E. Fischer and R. Huss

I.G., GP 698977 (Fr.-Bayer, I-1, 477)

FIAT 764 — Igenalbraun PRBF

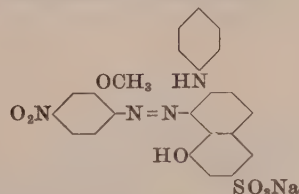
Soluble in water (reddish brown)

Very slightly soluble in ethanol

H2SO4 conc. — violet; on dilution — pink

Aqueous solution + HCl conc. — brownish orange;

+ NaOH conc. — red to magenta red

17580 C.I. Acid Black 31 (Bluish black)

4-Nitro-o-anisidine → (acid) N-Phenyl Gamma acid

Discoverers — O. Günther, L. Hesse, and A. Zart 1908

Bayer Co., BP 1397/09; USP 945780; FP 405928; GP 221214

(Fr. 10, 822)

BIOS 1548, 78

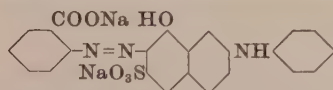
FIAT 764 — Supraminschwarz BR

Soluble in water (violet to bluish black) and ethanol (violet)

H2SO4 conc. — violet to bluish black; on dilution — violet grey

Aqueous solution + HCl conc. — violet black;

+ NaOH conc. — violet black

17590 C.I. Mordant Brown 40 (Dull brown)

Anthranilic acid → (alk.) N-Phenyl Gamma acid

Discoverers — O. Günther, L. Hesse, A. Zart, and H. Schweitzer 1910

Bayer Co., USP 982954

For similar dyes see —

Bayer Co., FP 413982; GP 233367 (Fr. 10, 831)

FIAT 764 — Saeureanthracenbraun PG

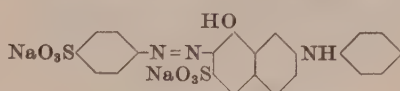
Soluble in water (orange to reddish brown)

Moderately soluble in ethanol and Cellosolve

Insoluble in other organic solvents

H2SO4 conc. — deep orange to red; on dilution weak brown to orange ppt.

HNO3 conc. — dark brown, turns yellow

Aqueous solution + HCl conc. — brown
+ NaOH conc. — orange brown**17595 C.I. Acid Brown 88 (Dull reddish brown)***

Sulfanilic acid → (alk.) N-Phenyl Gamma acid

* On leather

Discoverers — E. Fellmer, G. Manthe, and H. Noerr 1935

I.G., BP 456844; USP 2110394; FP 803467; GP 651308 (Fr. 24, 997)

FIAT 764 — Igenalbraun JTF

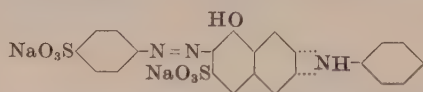
Soluble in water

Slightly soluble in ethanol (reddish brown)

H2SO4 conc. — red; on dilution — orange brown

Aqueous solution + HCl conc. — brown;

+ NaOH conc. — wine red

17596 C.I. Acid Brown 87 (Reddish brown)*Sulfanilic acid → (alk.) [0.6 mol. N-Phenyl Gamma acid]
[0.4 mol. N-Phenyl J acid]

* On leather

Discoverers — E. Fellmer, G. Manthe, and H. Noerr 1935

Igenal Brown IRF (IG)

I.G., BP 456844; USP 2110394; FP 803467; GP 651308 (Fr. 24, 997)

FIAT 764 — Igenalbraun JRF

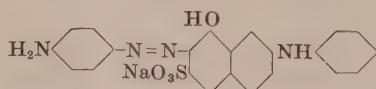
Soluble in water (reddish orange brown)

Slightly soluble in ethanol (orange brown)

H2SO4 conc. — cherry red; on dilution — orange brown

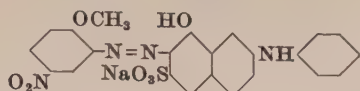
Aqueous solution + HCl conc. — orange brown;

+ NaOH conc. — reddish orange brown

17600 Acid Dyep-Aminoacetanilide → (alk.) N-Phenyl Gamma acid;
then hydrolyse the acetamido group

Discoverer — Bayer Co. 1905

Cashmere Blue V (By)

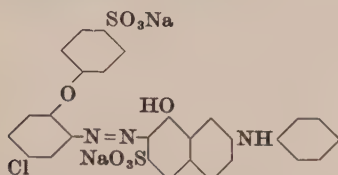
17605 C.I. Acid Brown 2 (Brown)

5-Nitro-*o*-anisidine → (alk.) *N*-Phenyl Gamma acid

Aqueous solution + HCl conc. — dark brown, ppt;
+ NaOH conc. — dark reddish brown, ppt.

Discoverers — O. Günther, L. Hesse, and A. Zart 1909
Bayer Co., GP 224497 (Fr. 10, 829)
FIAT 764 — Supraminbraun R

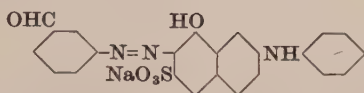
Slightly soluble in water (dark brown)
Moderately soluble in ethanol (reddish brown) and Cellosolve
Insoluble in other organic solvents
H₂SO₄ conc. — reddish violet; on dilution — olive brown
HNO₃ conc. — brown, changing to yellow brown

17610 C.I. Acid Brown 16 (Brown)

p-(2-Amino-4-chlorophenoxy)benzenesulfonic acid
→ (alk.) *N*-Phenyl Gamma acid

Discoverers — M. Herzberg and F. Runkel
Bayer Co., BP 14820/09; USP 953033-5; FP 407692; GP 221491
(Fr. 10, 817)
FIAT 764 — Sulfonsaeurebraun RR

Soluble in water (brown)
Slightly soluble in ethanol (brown)
H₂SO₄ conc. — reddish violet; on dilution — olive
Aqueous solution + HCl conc. — olive ppt;
+ NaOH conc. — wine red

17615 Acid Dye

m-Aminobenzaldehyde → (alk.) *N*-Phenyl Gamma acid

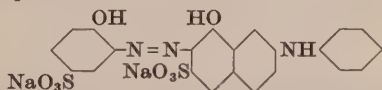
Aqueous solution + HCl conc. — olive brown ppt;
+ NaOH conc. — brownish to reddish orange

Discoverer — K. Thiess 1923
Amido Fast Brown 3R (MLB)
Dyes wool in the presence of sulfuric acid
M.L.B., USP 1540665-6; FP 573803; GP 414202 (Fr. 15, 477)
FIAT 764 — Amidoechtbraun 3R

Slightly soluble in water (brown)
Moderately soluble in ethanol (reddish brown)
H₂SO₄ conc. — orange red; on dilution — brown

17620 C.I. Acid Brown 86 (Dark brown)*

A copper complex derived from

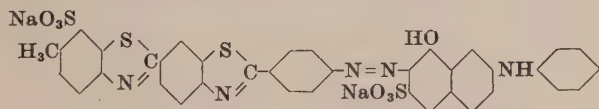


4-Methoxymetanilic acid → (alk.) *N*-Phenyl Gamma acid
then heat in aqueous solution with ammonia and copper sulfate for ½ hr. at 70°C to form the copper complex. (Copper complex formation is accompanied by replacement of the methoxyl group by a hydroxyl group)

* On leather

Discoverer — E. Fellmer 1938
I.G., FP 872807; GP 725211 (Fr.-Bayer, I-1, 897)
FIAT 764 — Igenalbraun JRBF

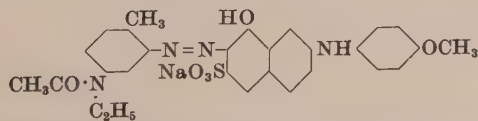
Soluble in water (reddish brown)
Very slightly soluble in ethanol
H₂SO₄ conc. — reddish violet; on dilution — brown
Aqueous solution + HCl conc. — brown ppt;
+ NaOH conc. — wine red

17630 C.I. Direct Brown 30 (Dull brown)

Primuline (C.I.49000) → (alk.) *N*-Phenyl Gamma acid
(In some brands the Primuline may be replaced wholly or partly by dehydrothio-*p*-toluidinesulfonic acid)

Discoverer — Cassella Co.
BIOS 1548, 92
FIAT 764 — Alphanolbraun B

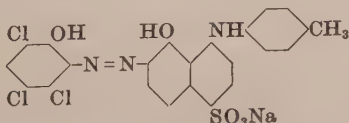
Soluble in water (yellowish olive brown) and ethanol
H₂SO₄ conc. — bordeaux; on dilution — brownish yellow to olive
Aqueous solution + HCl conc. — yellowish olive ppt;
+ NaOH conc. — olive brown ppt.

17640 C.I. Acid Brown 20 (Dull brown)

3'-Amino-*N*-ethyl-*p*-acetotoluidide
→ (alk.) *N*-*p*-Methoxyphenyl Gamma acid

Discoverer — H. Clingstein 1922
Bayer Co., BP 216971; GP 409280 (Fr. 14, 953)
FIAT 764 — Supraminbraun G

Soluble in water (brown)
Moderately soluble in ethanol (brown)
H₂SO₄ conc. — cherry red; on dilution — brown
Aqueous solution + HCl conc. — olive brown ppt;
+ NaOH conc. — reddish orange brown

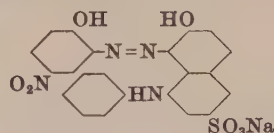
17650 C.I. Mordant Green 34 (Dull bluish green)

2-Amino-3,4,6-trichlorophenol → (alk.) *N*-*p*-Tolyl S acid

Discoverers — W. Herzberg and O. Scharfenberg 1920
Agfa, BP 192438; USP 1426189-90; GP 364829 (Fr. 14, 979)
FIAT 764 — Metachromblaugruen BL

17670

Mordant Dye



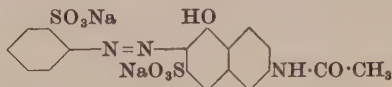
2-Amino-4-nitrophenol → 8-Anilino-2-naphthol-6-sulfonic acid

Diamond Olive GL (By)

FIAT 764 — Diamantoliv GL

17750

C.I. Acid Orange 27 (Bright orange)

*o*-Aminobenzenesulfonic acid → *N*-Acetyl J acidAqueous solution + HCl conc. — golden orange;
+ NaOH conc. — orange brown

Discoverers — R. Fleischhauer and E. Fischer 1933

I.G., BP 432020; USP 2102115; FP 777479; GP 628035 (Fr. 22, 943)

BIOS 1548, 43

FIAT 764 — Anthralanorange GG

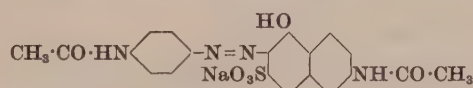
Soluble in water (golden orange)

Insoluble in ethanol

H₂SO₄ conc. — red; on dilution — golden orange

17755

C.I. Acid Red 137 (Yellowish red)*

*p*-Aminoacetanilide → *N*-Acetyl J acid

* On wool; red on paper

Discoverer — Badische Co.

FIAT 764 — Papierrot A ex.

Soluble in water (red)

Moderately soluble in ethanol (reddish orange)

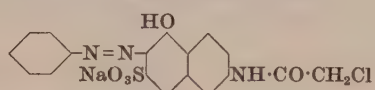
H₂SO₄ conc. — magenta red; on dilution — reddish orange

Aqueous solution + HCl conc. — reddish brown, ppt;

+ NaOH conc. — yellowish brown

17770

C.I. Acid Orange 30 (Bright orange)

Aniline → *N*-Chloroacetyl J acidAqueous solution + HCl conc. — orange;
+ NaOH conc. — orange brown

Discoverers — H. Clingstein and P. Zervas 1929

I.G., BP 341461; USP 1844031; FP 698219; GP 557126 (Fr. 19, 1660)

BIOS 961, 34

FIAT 764 — Supraminorange R

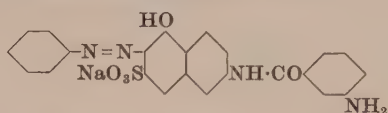
Soluble in water (orange)

Moderately soluble in ethanol (golden orange)

H₂SO₄ conc. — red; on dilution — orange

17780

C.I. Direct Red 118 (Bright red)*

Aniline → *N*-*m*-Aminobenzoyl J acid

* Developed with 2-naphthol

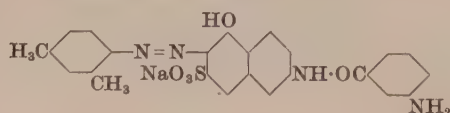
Discoverer — A. Bertschmann 1902

Ciba, BP 24936/03; USP 724078; FP 321640; GP 151017 (Fr. 7, 439)

Ruggli & Leupin, *Helv. Chim. Acta*, 22 (1939), 1170

17785

C.I. Direct Red 126 (Bright red)*

2,4-Xylydine → *N*-*m*-Aminobenzoyl J acid

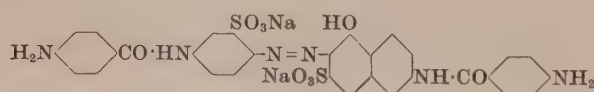
* Developed with 2-naphthol

Discoverer — A. Bertschmann 1902

Ciba, BP 13778/02; USP 724078; FP 321640; GP 151017 (Fr. 7, 439)

17800

C.I. Direct Red 147 (Bluish pink)

2-Amino-5-(*p*-nitrobenzamido)benzenesulfonic acid
→ *N*-*p*-Nitrobenzoyl J acid;

then reduce the nitro groups with sodium sulfide. The product is not homogeneous

M.L.B., GP 217628 (Fr. 10, 913)

FIAT 764 — Diazanilrosa B

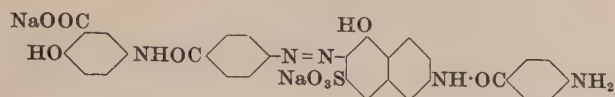
Soluble in water (red)

Slightly soluble in ethanol (pale orange red)

H₂SO₄ conc. — reddish violet; on dilution — pale orange red

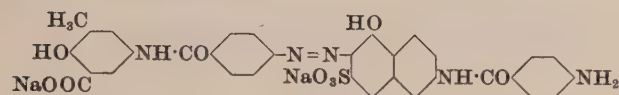
Aqueous solution + HCl conc. — red;

+ NaOH conc. — orange brown

17805 C.I. Direct Red 145 (Bright yellowish red)*

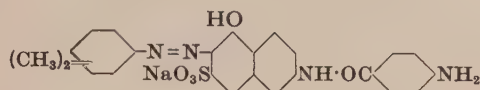
5-(*p*-Aminobenzamido)salicylic acid → *N*-*p*-Aminobenzoyl J acid

* Developed with 2-naphthol

17810 Direct Dye

5-(*p*-Aminobenzamido)-2,3-cresotic acid → *N*-*p*-Aminobenzoyl J acid

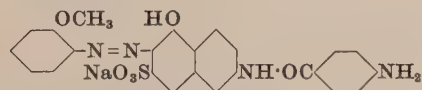
H₂SO₄ conc. — magenta; on dilution — orange
Aqueous solution + HCl conc. — orange brown ppt;
+ NaOH conc. — reddish orange brown

17815 C.I. Direct Red 216 (Bright yellowish red)

Mixed Xylidines → *N*-*p*-Aminobenzoyl J acid

(Note — In Diazo Brilliant Scarlet ROR extra (IG) the diazo component consisted of 0.9 mol. technical xylidines + 0.1 mol. *o*-toluidine)

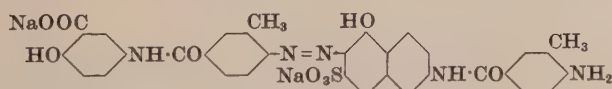
Aqueous solution + HCl conc. — red ppt;
+ NaOH conc. — orange brown ppt.

17820 C.I. Direct Red 123 (Red)*

o-Anisidine → *N*-*p*-Aminobenzoyl J acid

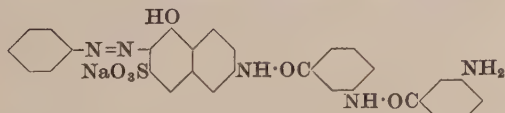
Note — In some brands e.g. Diazo Brilliant Scarlet ROA extra, to which the references given refer, a mixture of aniline and *o*-anisidine is used as diazo component)

* Developed with 2-naphthol

17830 C.I. Direct Red 144 (Bright red)*

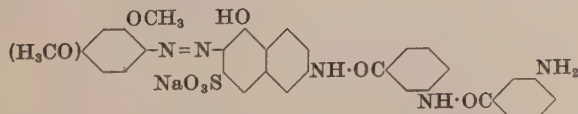
5-(4-Amino-3-methylbenzamido)salicylic acid
→ *N*-(4-Amino-*m*-toluyl) J acid

* Developed with 2-naphthol

17840 C.I. Direct Orange 75 (Bright reddish orange)*

Aniline → *N*-*m*-(*m*-Aminobenzamido)benzoyl J acid

* Developed with 2-naphthol

17845 Direct Dye

o (and *p*)-Anisidines → *N*-*m*-(*m*-Aminobenzamido)benzoyl J acid

Aqueous solution + HCl conc. — bluish red to bordeaux ppt;
+ NaOH conc. — orange brown ppt.

Discoverer — H. Roos 1938

I.G., USP 2232870; FP 866311; GP ap. I62376
FIAT 764 — Diazolichtscharlach FBL

Soluble in water (orange brown)
Moderately soluble in ethanol (orange)
H₂SO₄ conc. — magenta; on dilution — golden orange
Aqueous solution + HCl conc. — orange brown ppt;
+ NaOH conc. — reddish orange brown

Discoverers — H. Jordan and W. Neelmeier 1912

Fastness Properties (C), developed with 2-naphthol: Acid (organic) 3, Alkali 5, Light 3, 4, 4, Washing 2-3, Water 3-4

Dischargeability: neutral and alkaline, good

Bayer Co., BP 10168/13; USP 1097231; FP 457840; GP 268791 (Fr. 11, 396)

FIAT 764 — Diazolichtscharlach BL

Soluble in water (orange brown)
Moderately soluble in ethanol (orange)

Discoverer — A. Bertschmann 1902

Ciba BP 24936/02; USP 724078; FP 321640; GP 151017, 170045, (Fr. 7, 439, 174)

FIAT 764 — Diazobrillantscharlach ROR ex.

Soluble in water (orange red to red) and ethanol (brownish orange)
H₂SO₄ conc. — magenta to reddish violet; on dilution — red

Discoverer — A. Bertschmann 1902

Ciba BP 24936/02; USP 724078; FP 321640; GP 151017, 170045, (Fr. 7, 439, 174)

FIAT 764 — Diazobrillantscharlach ROA ex.

Soluble in water (red)
Moderately soluble in ethanol (reddish orange) and Cellosolve
Insoluble in other organic solvents
H₂SO₄ conc. — violet; on dilution — red
Aqueous solution + HCl conc. — red to bluish red ppt;
+ NaOH conc. — orange brown ppt.

Discoverer — H. Roos 1938

I.G., USP 2232870; FP 866311; GP ap. I62376
FIAT 764 — Diazobrillantscharlach 3BL ex.

Slightly soluble in water (bluish red to bordeaux)
Soluble in ethanol (reddish orange)
H₂SO₄ conc. — reddish violet; on dilution — magenta
Aqueous solution + HCl conc. — corinth ppt;
+ NaOH conc. — magenta

Discoverers — H. Jordan and W. Neelmeier 1911

Bayer Co., BP 14735/10; USP 993073; FP 428101; GP 230595 (Fr. 10, 915)

USP 994420 (reissue 13304); FP 428138; GP 240827 (Fr. 10, 192)
BIOS 1548, 154

FIAT 764 — Diazobrillantorange GR ex.

Slightly soluble in water and ethanol (orange)
H₂SO₄ conc. — red; on dilution — orange ppt.
Aqueous solution + HCl conc. — reddish orange ppt;
+ NaOH conc. — brownish orange

Discoverer — W. Neelmeier 1910

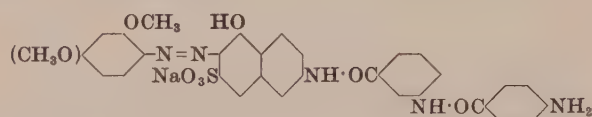
Diazo Brilliant Scarlet ROD extra (By)

Fastness Properties (C), developed with 2-naphthol: Acid (organic) 3, Alkali 3-4, Light 3, 3, 4, Washing 3-4, Water 4

Dischargeability: neutral and alkaline, good

Bayer Co. BP 14735/10; USP 994420; FP 428101, 428138; GP 230595, 240827, (Fr. 10, 915, 193)

Soluble in water (magenta) and ethanol (reddish orange)
H₂SO₄ conc. — bluish violet; on dilution — red

17860 Direct Dye

o-(and *p*)-Anisidines → *N-m*-(*p*-Aminobenzamido)benzoyl J acid

Aqueous solution + HCl conc. — magenta ppt;
+ NaOH conc. — orange brown ppt.

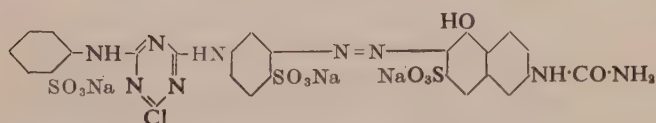
Discoverer — W. Neelmeier 1910

Diazo Brilliant Scarlet BG extra (By)

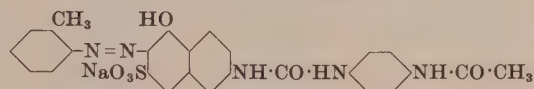
Fastness Properties (C), developed with 2-naphthol: Acid (organic) 3-4, Alkali 5, Light 2, Washing 2-3, Water 3-4

Bayer Co., BP 14735/10; USP 994420; FP 428101, 428138; GP 230595, 240827, (Fr. 10, 915, 193)

Soluble in water (red)
Moderately soluble in ethanol (reddish orange)
H₂SO₄ conc. — violet; on dilution — magenta

17865 C.I. Reactive Orange 2 (Bright orange)

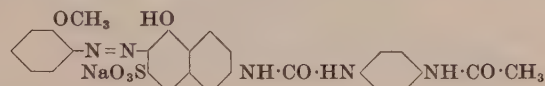
Panchartek, Allan and Mužík, Coll. Czech. Chem. Commun., 25 (1960) 2783-2799
Austrian Pat. 201,745

17870 C.I. Direct Red 65 (Yellowish red)

o-Toluidine
→ 6-(*p*-Acetamidophenylureido)-1-naphthol-3-sulfonic acid

Ciba, FP 319453; GP 148505 (Fr. 7, 438)

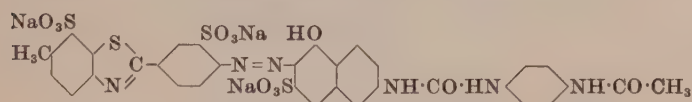
Soluble in water (reddish orange) and ethanol (orange)
H₂SO₄ conc. — magenta; on dilution — orange, red ppt.
Aqueous solution + HCl conc. — reddish orange;
+ NaOH conc. — reddish orange

17875 C.I. Direct Red 64 (Red)

o-Anisidine
→ 6-(*p*-Acetamidophenylureido)-1-naphthol-3-sulfonic acid

Ciba, FP 319453; GP 148505 (Fr. 7, 438)

Slightly soluble in water (red)
Moderately soluble in ethanol (orange)
H₂SO₄ conc. — violet; on dilution — scarlet red then ppt.
Aqueous solution + HCl conc. — magenta ppt;
+ NaOH conc. — reddish orange brown, ppt.

17880 C.I. Direct Red 113 (Red)

Dehydrothio-*p*-toluidine-3',7'-disulfonic acid
→ 6-(*p*-Acetamidophenylureido)-1-naphthol-3-sulfonic acid

Discoverer — J. Huisman 1922

I.G., BP 195649/23; USP 1483447; FP 564184; GP 445887 (Fr. 15, 527)

BIOS 1548, 61
FIAT 764 — Siriusscharlach B

Soluble in water (scarlet)
Very slightly soluble in ethanol
H₂SO₄ conc. — violet; on dilution — reddish orange brown
Aqueous solution + HCl conc. — orange brown ppt;
+ NaOH conc. — red ppt.

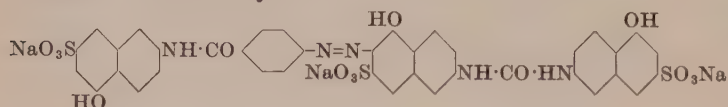
17890 Direct Dye

5-Amino-3-sulfosalicylic acid
→ 6,6'-Ureylenebis(1-naphthol-3-sulfonic acid)

Ergansoga Bordeaux 3641A (MLB)

Applied to cotton by the Batik process as developed in Indonesia. Is applied as a cold dyeing direct dye in the presence of a chromium salt (chrome oxalate-sulfate complex) followed by an aftertreatment with alkali, preferably lime, to complete lake formation

BIOS 961, 27

17895 Direct Dye

N-p-Aminobenzoyl J acid
→ 6,6'-Ureylenebis(1-naphthol-3-sulfonic acid)

Discoverer — A. Zart 1910

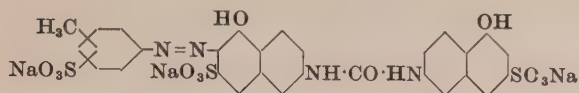
Para Scarlet G extra (By)

Fastness Properties (C), coupled with diazotised *p*-nitro-aniline: Acid (organic) 4, Alkali 5, Light 2, Washing 3, Water 3
Dischargeability, fair

Bayer Co., BP 19545/10; USP 1015375, 1022288, 1032797; FP 430030; GP 255115 (Fr. 11, 438)

Moderately soluble in water (scarlet)
Slightly soluble in ethanol (pale bluish violet)
H₂SO₄ conc. — reddish violet; on dilution — orange

Aqueous solution + HCl conc. — scarlet, partially ppt;
+ NaOH conc. — orange brown

17900 C.I. Direct Red 191 (Yellowish red)

Aminotoluenesulfonic acid
→ 6,6'-Ureylenebis(1-naphthol-3-sulfonic acid)

Soluble in water (yellowish red)
Slightly soluble in ethanol and Cellosolve
Insoluble in other organic solvents
H₂SO₄ conc. — reddish violet; on dilution — bright red
Aqueous solution + H₂SO₄ 10% — slightly redder;
+ NaOH 10% — pale bluish bordeaux

17905 Direct Dye

4-Chloro-*o*-anisidine → 6,6'-Ureylenebis(1-naphthol-3-sulfonic acid)

H₂SO₄ conc. — dark blue; on dilution — magenta red
Aqueous solution + HCl conc. — bordeaux, partially ppt;
+ NaOH conc. — reddish brown, partially ppt.

Discoverers — M. Kahn and A. Ossenbeck 1912

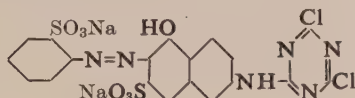
Para Scarlet 6B (By)

Fastness Properties (C), coupled with diazotised *p*-nitro-aniline: Acid (organic) 3, Alkali 5, Light 2,
Washing 3, Water 3
Dischargeability, fair

Bayer Co., BP 2550/12; USP 1060342; FP 452910; GP 254359
(Fr. 11, 438)

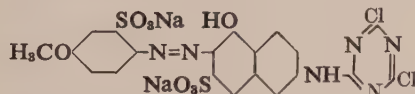
FIAT 764 — Parascharlach 6B ex.

Slightly soluble in water (magenta red)
Very slightly soluble in ethanol (pale orange)

17907 C.I. Reactive Orange 1 (Bright orange)

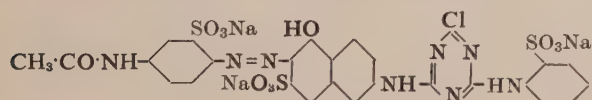
Orthanilic acid → J-acid
then condense with 1 mol. cyanuric chloride

H. Zollinger, *Angew. Chem.*, 73 (1961) 125-136

17908 C.I. Reactive Red 8 (Bright yellowish red)

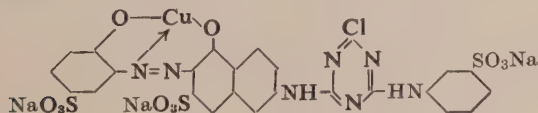
2-Amino-5-methoxybenzenesulfonic acid → J-acid
then condense with cyanuric chloride

Panchartek, Allan and Mužík, *Coll. Czech. Chem. Commun.*,
25 (1960) 2783-2799
Austrian Pat. 203,113

17910 C.I. Reactive Red 9 (Bright yellowish red)

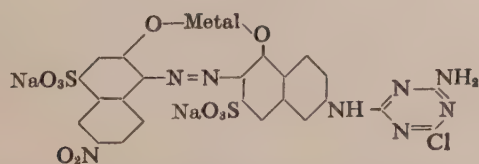
5-Acetamido-2-aminobenzenesulfonic acid → J-acid
and condense with cyanuric chloride, then with orthanilic acid

Călin, Săndulescu, Rosenberg and Tibrea, *Coloristica Buletin Informativ*, 4 (No. 11. 1968) 179-200
Lukos & Ornaf, *Barwniki Reaktywne*, Warsaw,
Wydawnictwo Przemysłu Lekkiego i Spożywczego, 1966

17912 C.I. Reactive Red 7 (Dull bluish red)

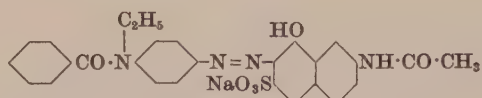
2-Amino-1-phenol-4-sulfonic acid → J-acid
and condense with cyanuric chloride, then with metanilic acid and the copper complex formed

Panchartek, Allan and Mužík, *Coll. Czech. Chem. Commun.*,
25 (1960) 2783-2799
Austrian Pat. 201,744

17916 C.I. Reactive Black 1 (Black)

1-Amino-6-nitro-2-naphthol-4-sulfonic acid → J-acid
and condense with cyanuric chloride, then with ammonia, and the metal complex formed. The metal is a mixture of chromium and cobalt, and is also complexed with salicylic acid

Panchartek, Allan and Mužík, *Coll. Czech. Chem. Commun.*,
25 (1960) 2783-2799

17920 C.I. Acid Red 68 (Red)

4'-Amino-*N*-ethylbenzanilide → *N*-Acetyl Gamma acid

Discoverer — R. Fleischhauer 1932

I.G., BP 424354; FP 761039; USP 2055377; GP 663381 (*Fr.* 22, 853)

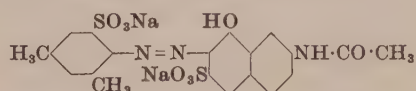
BIOS 1548, 51. FIAT 764 — Supraminrot BL

Soluble in water and ethanol (red)

H₂SO₄ conc. — cherry red; on dilution — orange red

Aqueous solution + HCl conc. — red;

+ NaOH conc. — brownish orange

17925 C.I. Acid Orange 9 (Reddish orange)

2-Amino-3,5-xylenesulfonic acid → *N*-Acetyl Gamma acid

Discoverers — R. Fleischhauer and E. Fischer 1934

I.G., BP 432020; USP 2102115; FP 777479; GP 628035 (*Fr.* 22, 943)

BIOS 1548, 52 FIAT 764 — Supraminrot GL

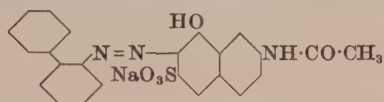
Soluble in water (orange)

Moderately soluble in ethanol (orange)

H₂SO₄ conc. — magenta red; on dilution — orange

Aqueous solution + HCl conc. — orange;

+ NaOH conc. — orange brown

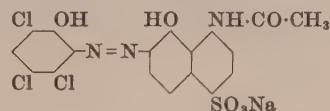
17930 C.I. Acid Red 15 (Yellowish red)

2-Biphenylamine → *N*-Acetyl Gamma acid

For preparation of the intermediates *see* —

Jenkins, McCullough & Booth, *Ind. Eng. Chem.*, 22 (1930), 33

Du Pont Co., USP 2062368

17940 C.I. Mordant Blue 7 (Reddish navy)

2-Amino-3,4,6-trichlorophenol → *N*-Acetyl S acid

Discoverers — W. Herzberg and O. Scharfenberg 1920

Agfa, BP 192438; USP 1408297, 1426189-90; GP 367362, 364829, (*Fr.* 14, 979, 979)

FIAT 764 — Metachrombrillantblau BL

Race, Rowe & Speakman, *JSDC*, 62 (1946), 372

Soluble in water (reddish blue) and ethanol (cobalt blue)

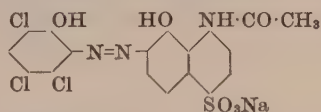
H₂SO₄ conc. — dark reddish brown; on dilution — reddish violet

Aqueous solution + HCl — rust brown;

+ NaOH — strawberry red

17941 C.I. Acid Blue 194 (Navy)

A 2:1 chromium complex of C.I. 17940:



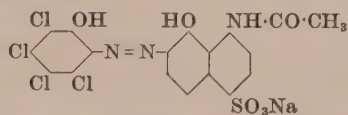
2-Amino-3,4,6-trichlorophenol → *N*-Acetyl S acid;
then convert to the chromium complex

Soluble in water and ethanol (reddish blue)

H₂SO₄ conc. — dull bluish brown; on dilution — reddish violet precipitate

Aqueous solution + HCl — reddish blue;

+ NaOH — bluish violet

17945 Mordant Dye

2-Amino-3,4,5,6-tetrachlorophenol → *N*-Acetyl S acid

Discoverers — W. Herzberg and O. Scharfenberg 1920

Metachrome Brilliant Blue GL (IG)

Metachrome dye used for fast navys on all forms of wool

Fastness Properties (C): Alkali 5, Carbonising 5,

Decatising 5, Light 7, Milling 5, Peroxide

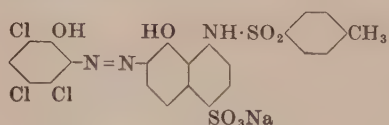
bleaching 4, Perspiration 5, Potting 3, Sea Water 5,

Stoving 4, Washing 4-5,

Slight change in hue in presence of copper or iron in the dyebath. Slight staining of acetate, cotton and viscose rayon effect threads

Agfa, BP 192438; USP 1408297; GP 368958 (*Fr.* 14, 980)

FIAT 764 — Metachrombrillantblau GL

17950 Mordant Dye

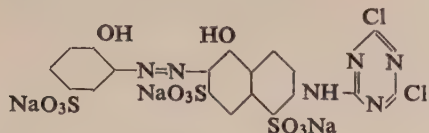
2-Amino-3,4,6-trichlorophenol → *N*-*p*-Tolylsulfonyl S acid

Discoverers — W. Herzberg and O. Scharfenberg 1920

Metachrome Brilliant Blue RRL (A)

Agfa, BP 192438; USP 1408297, 1426189-90; GP 364829 (*Fr.* 14, 979)

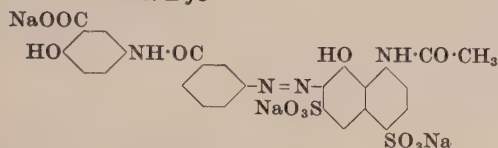
FIAT 1313, 2, 268

17965 C.I. Reactive Red 6 (Dull bluish red)

2-Amino-1-phenol-4-sulfonic acid \rightarrow 6-Amino-1-naphthol-3,5-disulfonic acid, then condense with 1 mol. cyanuric chloride and finally form the 1:1 copper complex

Rys & Zollinger, *Helv. Chim. Acta*, **49** (31 Jan 1966), 749-754

I.C.I. BP 838 311

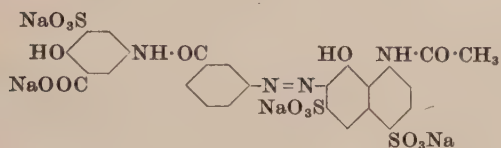
17970 Mordant Dye

5-(*m*-Aminobenzamido)salicylic acid \rightarrow *N*-Acetyl K acid

Discoverers — H. Jordan and W. Neelmeier 1912

Chrome Fast Scarlet GGD (By)

Bayer Co., GP 268791 (*Fr.* **11**, 396)

17975 Mordant Dye (Bluish red)

5-(*m*-Aminobenzamido)-3-sulfosalicylic acid \rightarrow *N*-Acetyl K acid

Discoverers — H. Jordan and W. Neelmeier 1912

Chrome Fast Red GD (By)

Bayer Co., GP 268791 (*Fr.* **11**, 396)

FIAT 764 — Chromechtrot GD

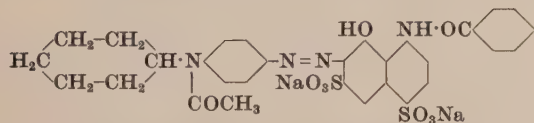
Soluble in water (reddish orange)

Insoluble in ethanol

H₂SO₄ conc. — magenta red; on dilution — red

Aqueous solution + HCl conc. — red;

+ NaOH conc. — orange brown

17990 C.I. Acid Red 157 (Bright red)

p-Amino-*N*-cyclohexylacetanilide \rightarrow *N*-Benzoyl K acid

Discoverers — G. Kalischer and R. Fleischhauer 1929

I.G., BP 340640; USP 1905294; FP 699897; GP 539725, (*Fr.* **18**, 967)

BIOS 1548, 58. FIAT 764 — Supranolbrillantrot G

Soluble in water (reddish orange)

Moderately soluble in ethanol (orange)

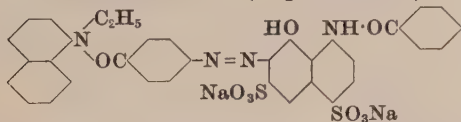
H₂SO₄ conc. — cherry red; on dilution — orange

Aqueous solution + HCl conc. — orange ppt;

+ NaOH conc. — orange brown

17995 C.I. Acid Red 133 (Bright bluish red \rightarrow Red)

C.I. Mordant Red 21 (Bright bluish red)



p-Amino-*N*-ethyl-*N*-1-naphthylbenzamide \rightarrow *N*-Benzoyl K acid

Discoverers — P. Hauptmann and A. Rohde 1912

Bayer Co., USP 1113622; FP 463844; GP 269213 (*Fr.* **11**, 386)

FIAT 764 — Saeurechromrot B

Soluble in water (red)

Moderately soluble in ethanol (magenta red)

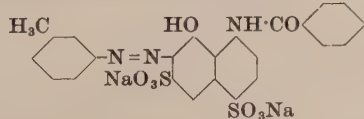
H₂SO₄ conc. — magenta red; on dilution — pink

Aqueous solution + HCl conc. — magenta red;

+ NaOH conc. — orange brown

18000 C.I. Acid Red 108 (Bright red)

18000:1 C.I. Pigment Red 66 (Bright red)



m-Toluidine \rightarrow *N*-Benzoyl K acid

C.I. 18000:1 is the barium salt

Discoverers — P. Julius and C. Immerheiser 1912

Badische Co., BP 15146/12; USP 1073902; FP 451878; GP 272863 (*Fr.* **11**, 461)

BIOS 1661, 166

FIAT 764 — Anthosin 3B

18001 Solvent Dye

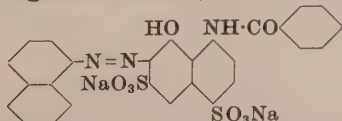
Cyclohexylamine salt of C.I.18000

Zapon Fast Red C2B (IG)

FIAT 1313, 3, 134 — Zapon Fast Red C2B

18005 C.I. Acid Violet 67 (Reddish violet)

18005:1 C.I. Pigment Violet 8 (Bluish violet)



1-Naphthylamine \rightarrow *N*-Benzoyl K acid

C.I. 18005:1 is the barium salt

Discoverers — P. Julius and C. Immerheiser 1912

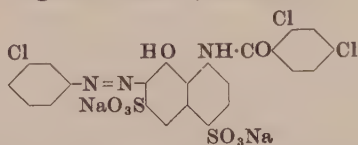
Basolan Violet B (IG)

Badische Co., USP 1073905; GP 272864 (*Fr.* **11**, 462)

BIOS 961, 14. BIOS 1661, 167

FIAT 764 — Anthosinviolett BB

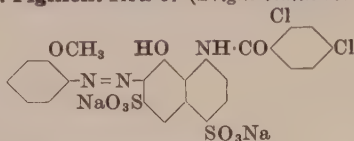
18020 C.I. Acid Red 110 (Bright red)
18020:1 C.I. Pigment Red 65 (Bright red)



m-Chloroaniline → *N*-2,4-Dichlorobenzoyl K acid
 C.I. 18020:1 is the barium salt

Discoverers — L. Blangey and C. Immerheiser 1912
 Badische Co., BP 15147/12; USP 1073951; FP 451878; GP 272862 (Fr. 11, 460)
 BIOS 961, 12. BIOS 1661, 166
 FIAT 764 — Anthosin B

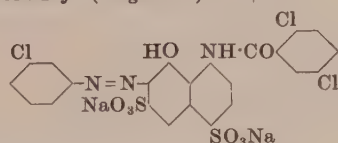
18025 C.I. Acid Red 107 (Bright bluish red)
18025:1 C.I. Pigment Red 67 (Bright bluish red)



o-Anisidine → *N*-2,4-Dichlorobenzoyl K acid
 C.I. 18025:1 is the barium salt

Discoverers — L. Blangey and C. Immerheiser 1912
 Badische Co., USP 1073951, 1073904; FP 451878; GP 272862 (Fr. 11, 460)
 BIOS 961, 13. BIOS 1661, 167
 FIAT 764 — Anthosin 5B

18030 Acid Dye (Bright red)

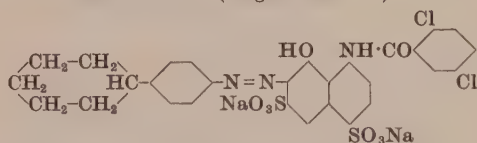


m-Chloroaniline → *N*-2,5-Dichlorobenzoyl K acid

Anthosin BN (IG)

Dyes wool bright red shades from acetic acid dyebath
 Fastness Properties (C): Light 5, Alkaline milling 2-3, Washing 3
 Forms pigments with alkaline earth metals
 BIOS 961, 13
 FIAT 764 — Anthosin BN
 For preparation of coupling component see —
 BIOS 986, 425

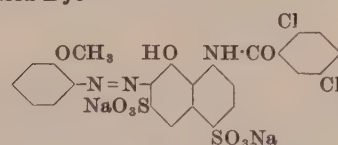
18035 C.I. Acid Red 161 (Bright bluish red)



p-Cyclohexylaniline → *N*-2,5-Dichlorobenzoyl K acid

Discoverers — G. Kalischer and C. Schultis
 Cassella Co., BP 336580; USP 1823943; FP 676761; GP 533617 (Fr. 18, 969)
 BIOS 1548, 58
 FIAT 764 — Supranolbrillantrot FB
 For preparation of coupling component see —
 BIOS 986, 425

18040 Acid Dye

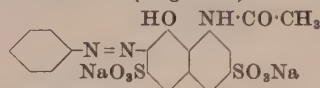


o-Anisidine → *N*-2,5-Dichlorobenzoyl K acid

Anthosin 5BN (IG)

Dyes wool bluish red shades from acetic acid dyebath
 Fastness Properties (C): Light 4-5, Alkaline milling 2, Washing 3
 Forms pigments with alkaline earth metals
 BIOS 961, 13
 FIAT 764 — Anthosin 5BN
 For preparation of coupling component see —
 BIOS 986, 425

18050 C.I. Acid Red 1 (Bright bluish red)
 C.I. Food Red 10 (Bright red)



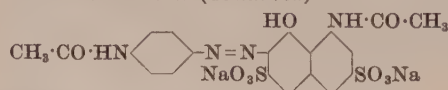
Aniline → *N*-Acetyl H acid

HCl conc. — red residue, soluble on dilution
 Aqueous solution + HCl conc. — red;
 + NaOH conc. — orange brown

Discoverer — M.L.B. 1902
 Bayer Co., BP 26457/04; FP 348426; GP 180089 (Fr. 8, 721) (Manufacture of lakes)
 FIAT 764 — Amidonaphtolrot G
 Baker, Davidson & Balmain, JSDC, 41 (1925), 269 (Spectrum)

Soluble in water (scarlet red)
 Slightly soluble in ethanol and Cellosolve
 Insoluble in other organic solvents
 H₂SO₄ conc. — bluish red; on dilution — yellower red
 HNO₃ conc. — orange red solution, becoming orange

18055 C.I. Acid Violet 7 (Reddish violet)
 C.I. Food Red 11 (Bluish red)

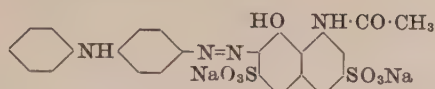


p-Aminoacetanilide → *N*-Acetyl H acid

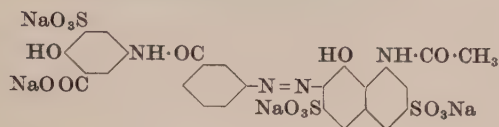
Aqueous solution + HCl conc. — magenta red
 + NaOH conc. — orange brown

Discoverer — M.L.B. 1902
 Bayer Co., BP 26457/04; FP 348426; GP 180089 (Fr. 8, 721) (Manufacture of lakes)
 BIOS 1548, 47
 FIAT 764 — Amidonaphtolrot 6B

Soluble in water (bluish red to magenta)
 Slightly soluble in ethanol, acetone and Cellosolve
 Insoluble in other organic solvents
 H₂SO₄ conc. — bluish red; on dilution — clear red
 HNO₃ conc. — crimson solution, turns orange

18058 C.I. Acid Blue 174 (Blue)

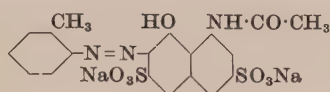
N-Phenyl-*p*-phenylenediamine → *N*-Acetyl H acid

18060 C.I. Mordant Red 51 (Bluish red)

5-(*m*-Aminobenzamido)-3-sulfosalicylic acid → *N*-Acetyl H acid

Discoverers — H. Jordan and W. Neelmeier 1912
Bayer Co., *GP* 268791 (*Fr.* 11, 396)
FIAT 764 — Chromechtrot BD

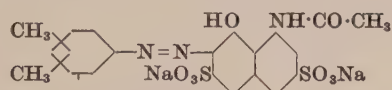
Soluble in water (red)
Insoluble in ethanol
 H_2SO_4 conc. — magenta red; on dilution — red
Aqueous solution + HCl conc. — magenta red;
+ NaOH conc. — orange brown

18065 C.I. Acid Red 35 (Bright bluish red)

o-Toluidine → *N*-Acetyl H acid

Discoverer — W. Duisberg 1923
BIOS 1548, 53. *FIAT* 764 — Supraminrot 3B

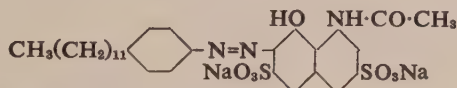
Soluble in water
Moderately soluble in ethanol (magenta red)
Slightly soluble in acetone
 H_2SO_4 conc. — magenta red; on dilution — pink
Aqueous solution + HCl conc. — magenta red;
+ NaOH conc. — orange brown

18070 C.I. Acid Red 40 (Bluish red)

Mixed Xylidines → *N*-Acetyl H acid

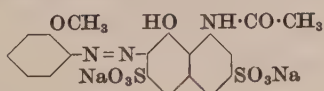
Calcocid Ceresine (CCC)

Soluble in water (red)
 H_2SO_4 conc. — bluish red; on dilution — pink
 HNO_3 conc. — pink
NaOH 10% — yellow

18073 C.I. Acid Red 138 (Bluish red)

p-Dodecylaniline → *N*-acetyl H-acid

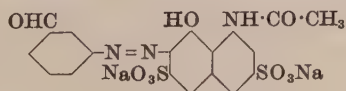
Smith and Reid, *Chem. & Ind* (1948), 675

18075 C.I. Acid Violet 12 (Bright reddish violet)

o-Anisidine → *N*-Acetyl H acid

Bayer Co., *BP* 26457/04; *FP* 348426; *GP* 180089 (*Fr.* 8, 721)
FIAT 764 — Amidobillantrot BB

Soluble in water (ruby red)
Moderately soluble in ethanol (ruby red);
 H_2SO_4 conc. — violet; on dilution — pink
Aqueous solution + HCl conc. — ruby red
+ NaOH conc. — orange brown

18080 Acid Dye

3-Aminobenzaldehyde → *N*-Acetyl H acid

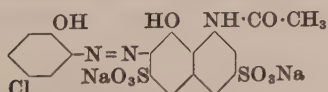
Discoverer — C. Thiess 1923

Amido Fast Red BB

Dyes wool neutral or in the presence of acid
Fastness Properties (C): Light 4, Milling 2-3,
Perspiration 2, Washing 2

M.L.B., *FP* 573603; *GP* 422214 (*Fr.* 15, 477)

Soluble in water
Moderately soluble in ethanol (orange red)
 H_2SO_4 conc. — cherry red; on dilution — reddish orange

18090 C.I. Mordant Blue 18 (Reddish navy)

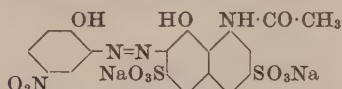
2-Amino-4-chlorophenol → *N*-Acetyl H acid

Discoverer — E. Fussenegger 1911

Badische Co., *BP* 25903/11; *USP* 1034898; *FP* 441620; *GP* 251842 (*Fr.* 11, 403)

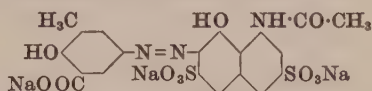
Soluble in water (magenta red)
Slightly soluble in ethanol
 H_2SO_4 conc. — dark blue; on dilution — magenta red
Aqueous solution + HCl conc. — magenta red;
+ NaOH conc. — bordeaux

18092 C.I. Mordant Green 52 (Dull bluish green)



2-Amino-4-nitrophenol → *N*-Acetyl H acid

18095 Mordant Dye (Bright violet)



5-Amino-2,3-cresotol acid → *N*-Acetyl H acid

Aqueous solution + HCl conc. — magenta red;
+ NaOH conc. — orange brown

Discoverers — H. Jordan and W. Neelmeier 1912

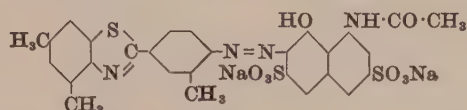
Chrome Brilliant Violet BD (By)

Prints on wool, silk or cotton mordanted with chrome acetate have good fastness to washing and poor fastness to light

Bayer Co., *BP* 17322/12; *USP* 1114711; *FP* 456761; *GP* 275835
(*Fr.* 12, 326)

Soluble in water (ruby red)
Slightly soluble in ethanol (violet)
 H_2SO_4 conc. — magenta red; on dilution — pink

18100 C.I. Direct Violet 10 (Bluish violet)



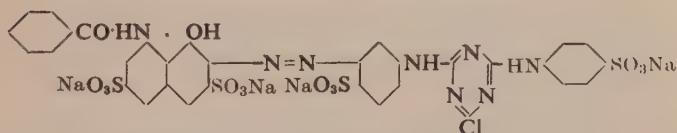
Dehydrothio-*m*-xylylidine → *N*-Acetyl H acid

Discoverer — J. Schmid 1899

Ciba, *BP* 12679/98; *USP* 620368; *FP* 278609; *GP* 113892
(*Fr.* 6, 1024)

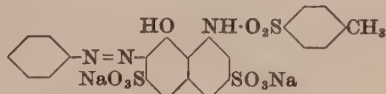
Soluble in water (reddish violet)
Slightly soluble in ethanol (pale violet)
 H_2SO_4 conc. — navy blue; on dilution — reddish violet
Aqueous solution + HCl conc. — wine red ppt;
+ NaOH conc. — pale magenta ppt.

18105 C.I. Reactive Red 4 (Bright bluish red)



Panchartek, Allan and Mužík, *Coll. Czech. Chem. Commun.*,
25 (1960) 2783–2799
Austrian Pat. 201,745

18110 C.I. Acid Red 106 (Bright red)



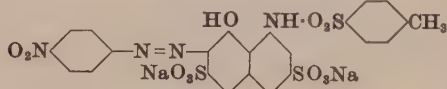
(a) Aniline → *N*-*p*-Tolylsulfonyl H acid; or
(b) Aniline → (*alk.*) H acid;
then treat with *p*-toluenesulfonyl chloride to form the sulfonamide

Discoverer — M. Böniger 1899

Sandoz, *BP* 22886/99; *USP* 640989; *FP* 294325
Ciba, *GP* 120081 (*Fr.* 6, 865)

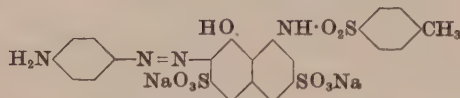
Soluble in water (bluish red) and ethanol (red)
Slightly soluble in acetone
 H_2SO_4 conc. — dark red; on dilution — turbid
 HNO_3 conc. — orange solution

18115 C.I. Acid Red 76 (Bright bluish red)



p-Nitroaniline → *N*-*p*-Tolylsulfonyl H acid

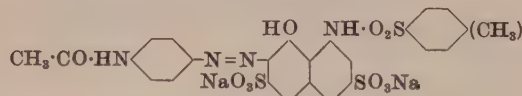
18120 C.I. Acid Blue 21 (Reddish blue)



Reduce the nitro group in C.I.18115 or hydrolyse the acetyl group in C.I.18125

Soluble in water (reddish violet)
 H_2SO_4 conc. — red; on dilution — unaltered
Aqueous solution + HCl conc. — brick red;
+ NaOH 10% — bluish red

18125 C.I. Acid Violet 5 (Reddish violet)

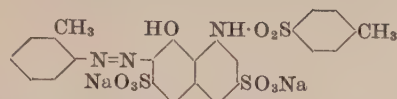


p-Aminoacetanilide → *N*-Phenylsulfonyl (or *p*-tolylsulfonyl) H acid

Discoverer — Cassella Co. 1900

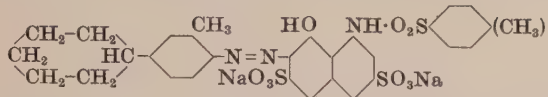
For dyes of similar constitution —
Ciba, *BP* 22886/99; *FP* 294325; *GP* 120081 (*Fr.* 6, 865)
BIOS 1548, 60
FIAT 764 — Lanafuchsin 6B

Soluble in water and ethanol (magenta red)
 H_2SO_4 conc. — brick red; on dilution — magenta red
Aqueous solution + HCl conc. — magenta red;
+ NaOH conc. — magenta red

18129 C.I. Acid Red 265

o-Toluidine → *N*-*p*-Tolylsulfonyl H acid

Discoverer — M. Böniger 1899
Sandoz, *BP* 22886/99; *USP* 640989; *FP* 294325
Ciba, *GP* 120081 (*Fr.* 6, 865)

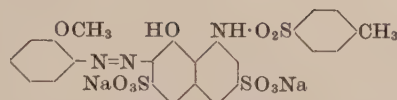
18130 C.I. Acid Red 155 (Bright bluish red)

4-Cyclohexyl-*o*-toluidine
→ *N*-Phenylsulfonyl(or *p*-tolylsulfonyl) H acid

Discoverers — G. Kalischer and C. Schultis 1928
I.G. *BP* 336580; *USP* 1823943; *FP* 676761; *GP* 533617 (*Fr.* 18, 989)

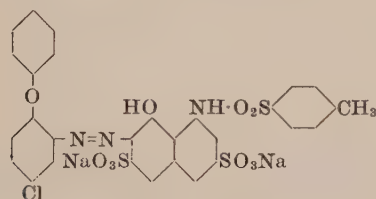
BIOS 1548, 56. *FIAT* 764 — Supranolbrillantrot 3B

Soluble in water and ethanol (magenta red)
 H_2SO_4 conc. — violet; on dilution — pink
Aqueous solution + HCl conc. — magenta red;
+ NaOH conc. — wine red

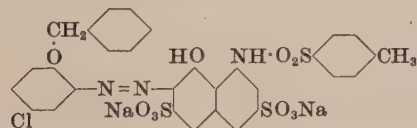
18133 C.I. Acid Red 264

o-Anisidine → *N*-*p*-Tolylsulfonyl H acid

Discoverer — M. Böniger 1899
Sandoz, *BP* 22886/99; *USP* 640989; *FP* 294325
Ciba, *GP* 120081 (*Fr.* 6, 865)

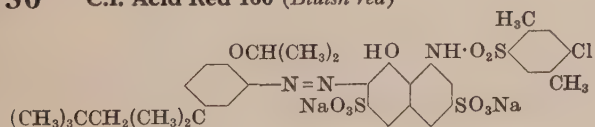
18134 C.I. Acid Red 249 (Bright bluish red)

5-Chloro-2-phenoxyaniline → *N*-*p*-Tolylsulfonyl H acid

18135 C.I. Acid Red 172 (Bluish red)

2-Benzyloxy-5-chloroaniline → *N*-*p*-Tolylsulfonyl H acid

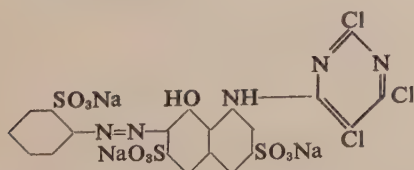
Discoverer — Geigy Co.
Fierz-David, *JSDC*, 45 (1929), 139

18150 C.I. Acid Red 160 (Bluish red)

2-Isopropoxy-5-(1,1,3,3-tetramethylbutyl)aniline
→ *N*-(4-Chloro-2,5-xylylsulfonyl) H acid

Discoverers — C. Schultis and E. Korten 1936
Supranol Brilliant Red 6B (IG)
I.G., *BP* 493406; *FP* 824628; *GP* 743673 (*Fr.*-Bayer, I-1, 513)
BIOS 1548, 57. *FIAT* 764 — Supranolbrillantrot 6B

Soluble in water (ruby) and ethanol (magenta red)
 H_2SO_4 conc. — dark blue; on dilution — magenta red
Aqueous solution + HCl conc. — ruby red;
+ NaOH conc. — magenta red

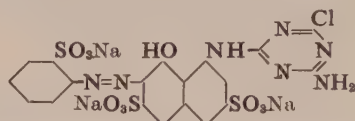
18155 C.I. Reactive Red 17 (Bright bluish red)

o-Aminobenzenesulfonic acid → H acid
then condense with 1 mol. of 2,4,5,6-tetrachloropyrimidine

Ackermann and Dussey, *Melliand Textilber.*, 42 (1961), 1164
Capponi, Metzger and Giamann, *Amer. Dye. Rep.*, 50 (1961), P505

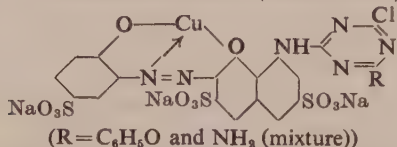
18156 C.I. Reactive Red 12 (Bright red)

Panchartek, Allan and Mužík, *Coll. Czech. Chem. Commun.*,
25 (1960) 2783-2799



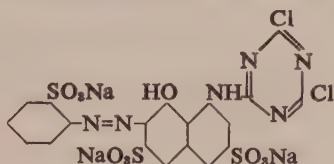
18157 C.I. Reactive Violet 2 (Reddish violet)

Panchartek, Allan and Mužík, *Coll. Czech. Chem. Commun.*,
25 (1960) 2783-2799
Austrian Pat. 201,744



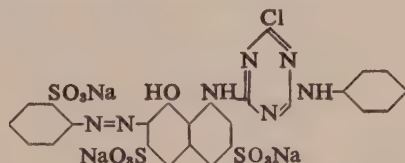
18158 C.I. Reactive Red 1 (Bright bluish red)

Călin, Săndulescu, Rosenberg and Tibrea, *Coloristica Buletin Informativ*, 4 (No. 11, 1968) 179-200
Lukos & Ornaf, *Barwniki Reaktywne*, Warsaw,
Wydawnictwo Przemysłu Lekkiego i Spozywczego, 1966



18159 C.I. Reactive Red 3 (Bright bluish red)

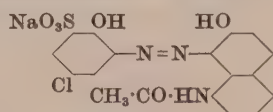
Călin, Săndulescu, Rosenberg and Tibrea, *Coloristica Buletin Informativ*, 4 (No. 11, 1968) 179-200
Lukos & Ornaf, *Barwniki Reaktywne*, Warsaw,
Wydawnictwo Przemysłu Lekkiego i Spozywczego, 1966



(More dyes of similar constitution appear from C.I. 18205 onwards)

18160 C.I. Mordant Black 38 (Bluish grey)

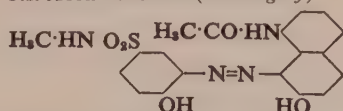
Discoverers — M. Kahn and A. Ossenbeck 1912
Bayer Co., BP 2956/12; USP 1078925; FP 453554; GP 263192
(Fr. 11, 402)
FIAT 764 — Metachromschwarzblau G
Soluble in water (wine red to reddish blue)
Slightly soluble in ethanol
Insoluble in acetone
H₂SO₄ conc. — reddish violet; on dilution — reddish orange brown
Aqueous solution + HCl conc. — reddish orange brown;
+ NaOH conc. — violet



6-Amino-4-chloro-1-phenol-2-sulfonic acid
→ N-(7-Hydroxy-1-naphthyl) acetamide

18165 C.I. Acid Black 60 (Bluish grey)

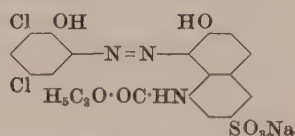
Ferrini and Zollinger, *Helv. Chim. Acta* 50 (1967) 897



2-Amino-N-methyl-1-phenol-4-sulfonamide
→ N-(7-Hydroxy-1-naphthyl) acetamide
1:2 Chromium complex

18170 C.I. Mordant Black 65 (Bluish grey → Bluish black)

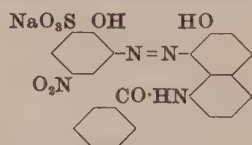
FIAT 764 — Diamantgrau GL



2-Amino-4,6-dichlorophenol
→ 7-Hydroxy-3-sulfo-1-naphthalenecarbamic acid, ethyl ester

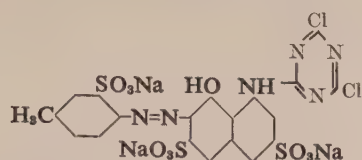
18180 C.I. Mordant Green 26 (Dull green)

Discoverer — I.G. 1933
FIAT 764 — Metachromoliv BL



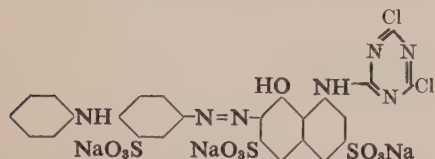
6-Amino-4-nitro-1-phenol-2-sulfonic acid
→ N-(7-Hydroxy-1-naphthyl)benzamide

18205 C.I. Reactive Red 88 (*Bluish red*)



6-Amino-*m*-toluenesulfonic acid \rightarrow H acid
then condense with cyanuric chloride

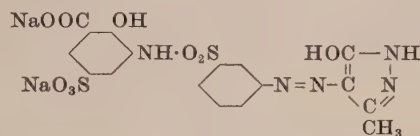
18245 C.I. Reactive Blue 81 (*Reddish blue*)



5-Amino-2-anilinobenzenesulfonic acid \rightarrow H acid
then condense with cyanuric chloride

18670 C.I. Acid Yellow 106 (*Greenish yellow*)

A chromium complex of



3-(*m*-Aminophenylsulfonamido)-5-sulfosalicylic acid
 \rightarrow 3-Methyl-5-pyrazolone;

then convert to the chromium complex by heating in aqueous solution at 85°C
with chromium formate

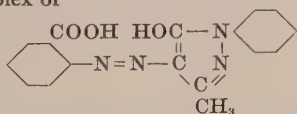
Discoverers — H. Winkeler and E. Fischer 1934

I.G., BP 439680; USP 2094832, 2152007; GP 633834 (*Fr.* 23, 857)
BIOS 1548, 15

FIAT 764 — Palatinechtgelb 6GEN

18690 C.I. Acid Yellow 121 (*Reddish yellow*)
C.I. Solvent Yellow 21 (*Yellow*)

A chromium complex of



Anthranilic acid \rightarrow 3-Methyl-1-phenyl-5-pyrazolone;

then heat with chromium formate in formamide solution for 6 hr. at 113–115°C to form the chromium complex which contains 1 atom of chromium per 2 mol. dye

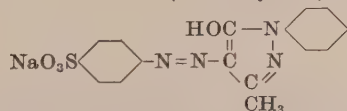
Discoverer — I.G.

I.G., BP 272908; USP 1693448; FP 272908; GP 479373 (*Fr.* 16, 975)

BIOS 961, 94 (Perlon Fast Yellow G)

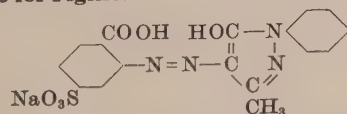
FIAT 764 — Zaponechtgelb R

18695 C.I. Acid Yellow 4 (*Reddish yellow*)



Sulfanilic acid \rightarrow 3-Methyl-1-phenyl-5-pyrazolone

18700 Dye for Pigments



4-Sulfoanthranilic acid \rightarrow 3-Methyl-1-phenyl-5-pyrazolone

Discoverers — W. Dollfus and R. Hagenbach 1903

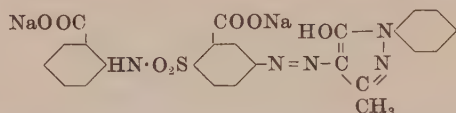
Pigment Fast Yellow G (MLB)

The barium salt was formerly used as a pigment for colouring paper

Fastness Properties: Alkali, Spirit and Water, good
M.L.B., USP 731670; FP 338531; GP 150125 (*Fr.* 7, 460)
Meyer, *Chim. et Ind.* 2 (1919), 786

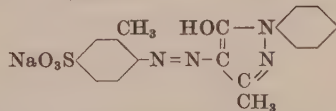
Slightly soluble in cold water
Soluble in hot water (yellow)

H₂SO₄ conc. — yellow; on dilution — light yellow ppt.
Aqueous solution + HCl — yellow ppt, soluble in excess;
+ NaOH — unaltered

18710 C.I. Mordant Yellow 30 (Dull reddish yellow)

N-(4-Amino-2-carboxyphenylsulfonyl)anthranilic acid
→ 3-Methyl-1-phenyl-5-pyrazolone

Discoverer — I.G. 1938
FIAT 764 — Metachromgelb KE

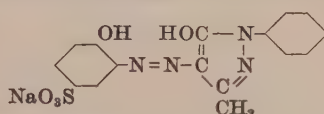
18720 Dye for Pigments

4-Amino-*m*-toluenesulfonic acid → 3-Methyl-1-phenyl-5-pyrazolone

Pigment Fast Yellow R (MLB)

The barium salt was formerly used as a yellow pigment for book and lithographic printing, wallpapers and marbled papers
Fastness Properties: Alkali, Spirit and Water, good
M.L.B., *FP* 338531; *GP* 152862 (*Fr.* 7, 461)

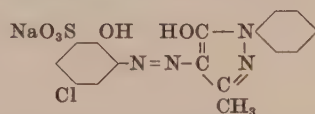
Soluble in hot water (yellow)
Slightly soluble in cold water
 H_2SO_4 conc. — yellow; on dilution — pale yellow flocculent ppt.
Aqueous solution + HCl — yellow ppt;
+ NaOH — not altered appreciably

18730 C.I. Mordant Orange 37 (Dull reddish orange)

2-Amino-1-phenol-4-sulfonic acid
→ 3-Methyl-1-phenyl-5-pyrazolone

M.L.B., *BP* 20276/00; *FP* 305491; *GP* 134162 (*Fr.* 6, 909)
FIAT 764 — Chromorange LR

Soluble in water
Moderately soluble in ethanol (greenish yellow)
 H_2SO_4 conc. — greenish yellow; on dilution — greenish yellow
Aqueous solution + HCl conc. — greenish yellow;
+ NaOH conc. — greenish yellow

18732 See page 4138 (immediately after 19610)**18735 C.I. Mordant Red 19 (Bright red)**

6-Amino-4-chloro-1-phenol-2-sulfonic acid
→ 3-Methyl-1-phenyl-5-pyrazolone

BIOS 961, 42
FIAT 764 — Metachromrot 5G

Soluble in water (orange red), ethanol (brownish orange), acetone and Cellosolve
Insoluble in other organic solvents
 H_2SO_4 conc. — yellowish orange; on dilution — yellow, slight ppt.
 HNO_3 conc. — pale olive brown solution
Aqueous solution + NaOH 10% — yellowish orange

18736 C.I. Acid Red 180 (Red)**18736:1 C.I. Solvent Orange 6 (Reddish orange)**

Convert C.I.18735 to the chromium complex by heating with chromium formate in aqueous solution at 125°C for 30–40 min.

C.I. 18736:1 is the acid form of the dye

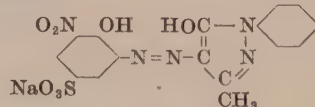
Discoverer — F. Straub 1923
Ciba, *BP* 186635; *USP* 1440566; *GP* 366095 (*Fr.* 14, 986)
BIOS 961, 73. *BIOS* 1548, 23
FIAT 764 — Palatinechtrot RN

H_2SO_4 conc. — dull reddish yellow; on dilution — reddish yellow
 HNO_3 conc. — yellowish red

Soluble in water, ethanol and acetone
Insoluble in toluene

18740 C.I. Acid Orange 72 (Reddish orange)

A chromium complex of

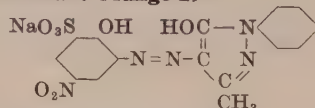


2-Amino-6-nitro-1-phenol-4-sulfonic acid
→ 3-Methyl-1-phenyl-5-pyrazolone;

then heat with chromium sulfate and chromium formate in aqueous solution for 6 hr. at 130°C to convert to the chromium complex

Discoverer — F. Lange 1933
I.G., *GP* 600250 (*Fr.* 21, 916)
BIOS 961, 73
FIAT 764 — Palatinechtorange RN

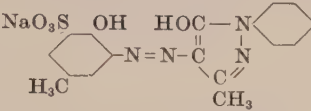
Soluble in water (orange), and ethanol, acetone and Cellosolve
Insoluble in other organic solvents
 H_2SO_4 conc. — dull greenish yellow; on dilution — yellowish orange
 HNO_3 conc. — brown solution, turns to reddish yellow
HCl conc. — yellow solution
NaOH 10% — no change

18744 C.I. Mordant Orange 29

6-Amino-4-nitro-1-phenol-2-sulfonic acid
→ 3-Methyl-1-phenyl-5-pyrazolone

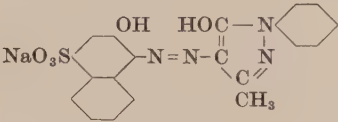
18745 C.I. Acid Orange 74 (Orange)
18745:1 C.I. Solvent Orange 5 (Orange)
 Convert C.I.18744 to the chromium complex by heating with chromium formate in aqueous solution at 130°C for 3 hr.
 C.I. 18745:1 is the acid form of the dye

I.G., BP 296616
 BIOS 961, 73
 FIAT 764 — Palatinechtorange GN, GEN
 FIAT 1313, 3, Zapon Fast Orange G (acid)
 Soluble in water (orange), and ethanol
 Slightly soluble in Cellosolve
 H₂SO₄ conc. — dull yellow; on dilution — orange
 NaOH 10% — orange solution

18750 C.I. Mordant Red 17 (Dull yellowish red)

 5-Amino-6-hydroxy-*m*-toluenesulfonic acid
 → 3-Methyl-1-phenyl-5-pyrazolone

Discoverer — M.L.B. 1901
 M.L.B., FP 305491; GP 134163 (Fr. 6, 912)
 FDX 885 — Saeurealizarinrot C

Soluble in water (yellowish brown)
 H₂SO₄ conc. — orange red; on dilution — yellowish orange, ppt.
 HCl conc. — yellowish brown, ppt.
 Aqueous solution + NaOH — yellow

18760 C.I. Mordant Red 7 (Bluish red)

 1-Amino-2-naphthol-4-sulfonic acid
 → 3-Methyl-1-phenyl-5-pyrazolone

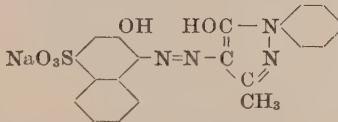
Discoverer — H. Hagenback 1904
 Geigy, BP 10235/04; USP 793743; FP 349989; GP 171024 (Fr. 8, 640)
 BP 17274/04; USP 808919; FP 350161; GP 165743 (Fr. 8, 664)
 Mayer, *Chim. et Ind.* 2 (1919), 786
 Morgan & Main Smith, *JCS*, 125 (1924), 1732; *JSDC*, 41 (1925), 233
 Drew & Fairbairn, *JCS* (1939), 828
 Beech & Drew, *JCS* (1940), 604

Soluble in water (yellowish to brownish red)
 Slightly soluble in ethanol and acetone
 H₂SO₄ conc. — magenta red; on dilution — orange
 HNO₃ conc. — decolorised

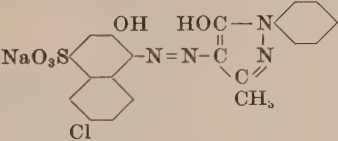
Aqueous solution + H₂SO₄ 10% — reddish orange;
 + NaOH conc. — redder and brighter

18761 C.I. Acid Red 201 (Bluish pink)
18761:1 Solvent Dye
 A chromium complex of C.I.18760
 C.I. 18761:1 was the acid form of the dye

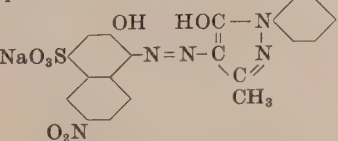
Zapon Fast Red B (IG) (Solvent dye)
 FIAT 1313, 3, 134 Zaponechtrot B
 H₂SO₄ conc. — reddish orange; on dilution — yellowish red
 HNO₃ conc. — brownish yellow
 HCl conc. — red; red on dilution

18762 C.I. Acid Violet 90 (Reddish violet)
 A 2:1 chromium complex of

 1-Amino-2-naphthol-4-sulfonic acid
 → 3-Methyl-1-phenyl-5-pyrazolone;
 then convert to the chromium complex

Soluble in water (bluish red) and in ethanol (reddish violet)
 H₂SO₄ conc. — bluish red; on dilution — red
 Aqueous solution + HCl — orange red (red precipitate);
 + NaOH — red (red precipitate)

18765 C.I. Mordant Red 73

 1-Amino-6-chloro-2-naphthol-4-sulfonic acid
 → 3-Methyl-1-phenyl-5-pyrazolone

BIOS 1548, 84; BIOS 1661, 12
 FIAT 764 — Saeurealizarinrot 3B

18770 C.I. Mordant Red 49 (Bluish red)
 A chromium complex of

 1-Amino-6-nitro-2-naphthol-4-sulfonic acid
 → 3-Methyl-1-phenyl-5-pyrazolone
 then convert to the chromium complex

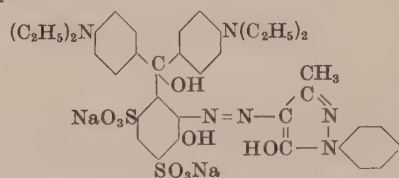
Discoverer — J. Hagenbach 1904
 Geigy, GP 165743 (Fr. 8, 663)

Soluble in water (reddish brown), ethanol and acetone
 H₂SO₄ conc. — dark orange; on dilution — yellowish brown solution and ppt.
 HNO₃ conc. — brownish olive
 NaOH dil. — dark red solution
 Aqueous solution + HCl conc. — orange ppt.

18775 C.I. Acid Green 2 (Green)

Discoverer — Ciba

Copper complex of



(2-Amino-3-hydroxy-4,6-disulphophenyl)-
bis(*p*-diethylaminophenyl)methanol
→ 3-Methyl-1-phenyl-5-pyrazolone

Soluble in water (green)

 H_2SO_4 conc. — yellow; on dilution — reddish brown ppt.

Aqueous solution + HCl — reddish brown ppt;

+ NaOH — unchanged

Note — For other Azo-Triarylmethane dyes see C.I.43840
and 43845

18780 C.I. Direct Yellow 14 (Yellow)

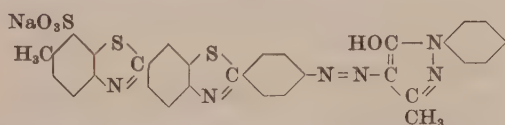
Discoverer — F. Scholl 1899

M.L.B., BP 10127/00; USP 658857; FP 300890; GP 117575

(Fr. 6, 1010)

BIOS 961, 22

FIAT 764 — Dianigelb R

Meyer, *Chim. et Ind.* 2 (1919), 785

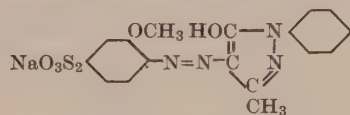
Primuline (C.I.49000) → 3-Methyl-1-phenyl-5-pyrazolone

Soluble in water (yellow)

 H_2SO_4 conc. — yellow; on dilution — orange yellow ppt.

Aqueous solution + HCl — orange yellow ppt;

+ NaOH — slightly darker

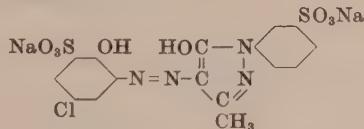
18790 C.I. Condense Sulphur Orange 2 (Bright yellowish orange)**18800 C.I. Acid Red 183 (Yellowish red)**

A chromium complex of

Ciba, USP 1959507; FP 756136; GP 588524 (Fr. 20, 1180)

BIOS 961, 73

FIAT 764 — Palatinechtrot GREN



6-Amino-4-chloro-1-phenol-2-sulfonic acid

→ 3-Methyl-1-(*m*-sulfophenyl)-5-pyrazolone;

then heat in aqueous solution with chromium formate for 3 hr. at 125°C to
form the chromium complex

Soluble in water (red)

 H_2SO_4 conc. — reddish yellow; on dilution — orangeAqueous solution + H_2SO_4 10% — slightly bluer;

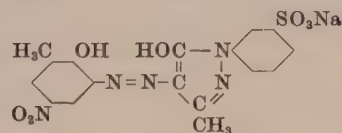
+ NaOH 10% — orange

18805 Mordant Dye (Bright reddish orange)

Discoverer — I.G. 1933

Metachrome Orange 4RL (IG)

FIAT 764 — Metachromorange 4RL

6-Amino-4-nitro-*o*-cresol→ 3-Methyl-1-(*m*-sulfophenyl)-5-pyrazolone**18810 C.I. Acid Red 186 (Bluish pink)**

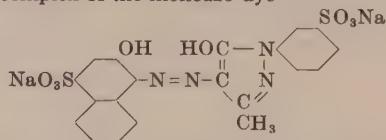
A chromium complex of the monoazo dye

Discoverer — H. Kämmerer 1927

I.G., BP302709; USP 1753120; FP 667123; GP 491513 (Fr. 16, 980)

BIOS 961, 73, 165

FIAT 764 — Palatinechtrosa BN



1-Amino-2-naphthol-4-sulfonic acid

→ 3-Methyl-1-(*m*-sulfophenyl)-5-pyrazolone;

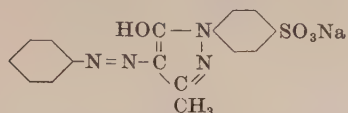
then heat with chromium formate in aqueous solution at 125°C for 3–5 hr. to
convert to the chromium complex

Soluble in water

Slightly soluble in ethanol and acetone

Insoluble in toluene

 H_2SO_4 conc. — brownish red; on dilution — pink

18820 C.I. Acid Yellow 11 (*Bright yellow*)Aniline → 3-Methyl-1-(*p*-sulfophenyl)-5-pyrazoloneAqueous solution + H₂SO₄ 10% — no change;
+ NaOH conc. — no change*Discoverer* — C. Möllenhoff 1892

BIOS 961, 30

FIAT 764 — Flavazin L

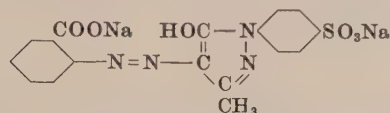
Möllenhoff, *Ber.* 25 (1892), 1945Meyer, *Chim. et Ind.* 2 (1919), 785

Very soluble in water, ethanol and Cellosolve (yellow)

Soluble in acetone

Slightly soluble in benzene

Insoluble in other organic solvents

H₂SO₄ conc. — yellow; on dilution — yellowHNO₃ conc. — yellow**18821 C.I. Mordant Yellow 8** (*Yellow* → *Reddish yellow*)Anthranilic acid → 3-Methyl-1-(*p*-sulfophenyl)-5-pyrazoloneM.L.B., *GP* 295051 (*Fr.* 13, 495)

BIOS 961, 57. BIOS 1548, 83

FIAT 764 — Saeurealizarinflavin R

Crossley, *Amer. Dyes. Rep.* 27 (1938), 128

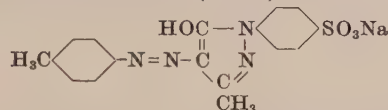
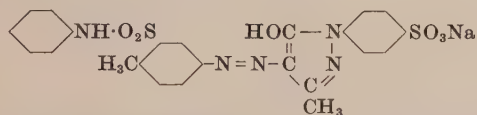
Soluble in water (yellow)

Slightly soluble in ethanol and Cellosolve

Insoluble in other organic solvents

H₂SO₄ conc. — yellow; on dilution — yellow solutionHNO₃ conc. — greenish yellow solution

HCl conc. — greenish yellow solution

18830 C.I. Acid Yellow 12 (*Yellow*)*p*-Toluidine → 3-Methyl-1-(*p*-sulfophenyl)-5-pyrazolone*Discoverer* — P. Volkmann 1908Bayer Co., *USP* 935829; *GP ap.* F25538 (*Fr.* 9, 307)H₂SO₄ conc. — yellow**18835 C.I. Acid Yellow 25** (*Yellow*)5-Amino-*o*-toluenesulfonanilide→ 3-Methyl-1-(*p*-sulfophenyl)-5-pyrazolone*Discoverers* — O. Dressel, H. Kothe, and H. Hörlein 1909Bayer Co., *BP* 12205/09; *USP* 965882; *GP* 226239 (*Fr.* 10, 806)

BIOS 961, 64

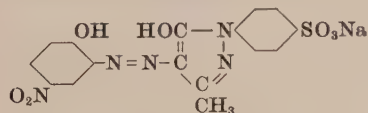
FIAT 764 — Supramingelb R

Soluble in water (yellow — turbid in the cold)

Slightly soluble in ethanol and acetone

H₂SO₄ conc. — yellow; on dilution — flocculent yellow ppt.

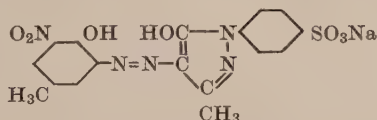
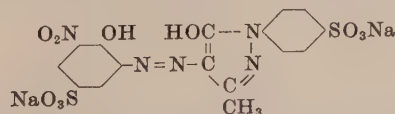
Aqueous solution + NaOH dil. — no change

18840 C.I. Mordant Orange 3 (*Dull reddish orange*)2-Amino-4-nitrophenol → 3-Methyl-1-(*p*-sulfophenyl)-5-pyrazoloneCrossley, *Amer. Dyes. Rep.* 27 (1938), 128

Soluble in water (yellowish orange)

H₂SO₄ conc. — yellow; on dilution — orange solution, yellow ppt.

NaOH conc. — orange yellow solution

18841 C.I. Mordant Red 94 (*Red*)2-Amino-6-nitro-*p*-cresol → 3-Methyl-1-(*p*-sulfophenyl)-5-pyrazolone**18845 C.I. Mordant Orange 35** (*Dull yellowish red*)

2-Amino-6-nitro-1-phenol-4-sulfonic acid

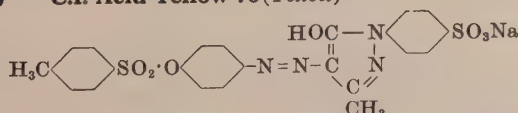
→ 3-Methyl-1-(*p*-sulfophenyl)-5-pyrazolone

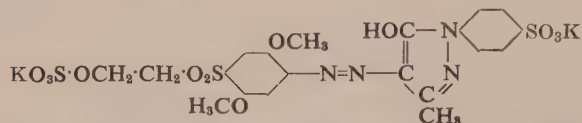
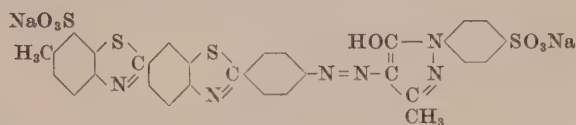
Soluble in water (yellowish orange)

H₂SO₄ conc. — yellow; on dilution — yellow solution

HCl conc. — yellow solution

NaOH conc. — brown solution

18850 C.I. Acid Yellow 76 (*Yellow*)*p*-Aminophenol → 3-Methyl-1-(*p*-sulfophenyl)-5-pyrazolone;then esterify the phenolic hydroxy group with *p*-toluenesulfonyl chloride

**18855 C.I. Direct Yellow 17 (Reddish yellow)**

Primuline (C.I.49000) → 3-Methyl-1-(*p*-sulfophenyl)-5-pyrazolone

Discoverer — F. Scholl 1900

M.L.B.; BP 10127/00; USP 658859; FP 300890; GP 117575 (Fr. 6, 1010)

BIOS 961, 23

FIAT 764 — Dianilgelb RR

Meyer, *Chim. et Ind.* 2 (1919), 785

Vlies, *JSDC*, **30** (1914), 100

Soluble in water (reddish yellow)

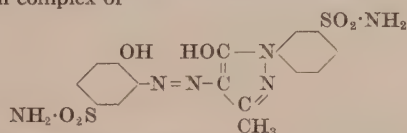
H₂SO₄ conc. — yellow; on dilution — orange yellow ppt.

Aqueous solution + HCl — orange yellow flocculent ppt;

+ NaOH — darker solution

18870 C.I. Acid Orange 76 (Dull reddish orange)

A chromium complex of



2-Amino-1-phenol-4-sulfonamide

→ 3-Methyl-1-(*m*-sulfamoylphenyl)-5-pyrazolone;

then convert to the chromium complex

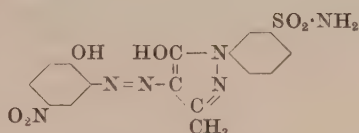
Discoverers — H. Gubler, H. Stahel, and F. Straub 1925

Ciba, BP 254708; USP 1623005; FP 617243; GP 445888 (Fr. 15, 499)

H₂SO₄ conc. — greenish yellow; on dilution — yellow

18875 Acid Dye

A chromium complex of



2-Amino-4-nitrophenol

→ 3-Methyl-1-(*m*-sulfamoylphenyl)-5-pyrazolone;

then convert to the chromium complex containing one atom of chromium to 2 mol. monoazo dye

Perlon Fast Orange RRS (IG)

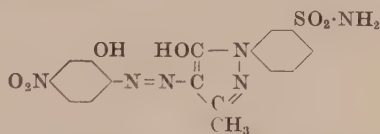
For dyeing of "Perlon"

BIOS 961, 92

BIOS MISC 20, 31 — Perlon Fast Orange RRS

18880 C.I. Acid Red 38 (Yellowish red)

A chromium complex of



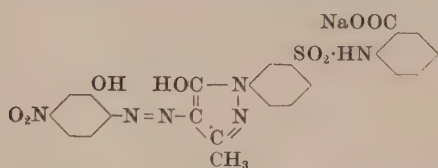
2-Amino-5-nitrophenol

→ 3-Methyl-1-(*m*-sulfamoylphenyl)-5-pyrazolone;

then convert to the chromium complex containing one atom of chromium to 2 mol. monoazo dye

BIOS 961, 92

BIOS MISC 20, 31 — Perlon Fast Red BS

18885 C.I. Mordant Red 39 (Bluish red)

2-Amino-5-nitrophenol

→ 1-[*m*-(*α*-Carboxyphenyl)sulfamoyl]phenyl]-3-methyl-5-pyrazolone

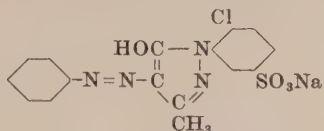
Discoverer — I.G. 1936

BIOS 961, 43, 127

FIAT 764 — Metachromrot BB

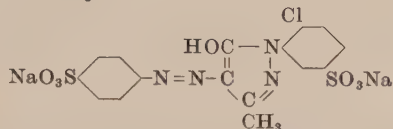
18890 C.I. Acid Yellow 34 (Bright yellow)

FIAT 764 — Echtlichtgelb D3GA



Aniline → 1-(2-Chloro-5-sulfophenyl)-3-methyl-5-pyrazolone

Soluble in water (yellow) and Cellosolve
Slightly soluble in ethanol
H₂SO₄ conc. — greenish yellow; on dilution — greenish yellow
HCl conc. — greenish yellow
Aqueous solution + NaOH 10% — slightly redder yellow

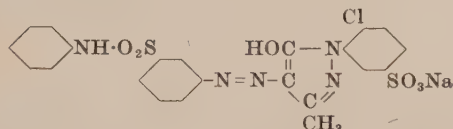
18895 Acid Dye

Sulfanilic acid → 1-(2-Chloro-5-sulfophenyl)-3-methyl-5-pyrazolone

Soluble in water (greenish yellow)
Slightly soluble in ethanol
H₂SO₄ conc. — greenish yellow; on dilution — unaltered
Aqueous solution + HCl conc. — no change;
+ NaOH conc. — slightly redder

18900 C.I. Acid Yellow 29 (Yellow)

Discoverers — H. Eichwede and J. Rachor 1928
I.G., BP 319585; USP 1876884; GP 543230 (Fr. 18, 972)
BIOS 961, 65, 155
FIAT 764 — Supramingelb 3GL

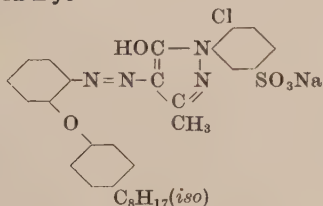


Metanilanilide → 1-(2-Chloro-5-sulfophenyl)-3-methyl-5-pyrazolone

Soluble in water (yellow — turbid in the cold), ethanol and acetone
Insoluble in toluene
H₂SO₄ conc. — yellow; on dilution — not ppt.
Aqueous solution + HCl dil. — no change;
+ NaOH dil. — no change

18910 Acid Dye

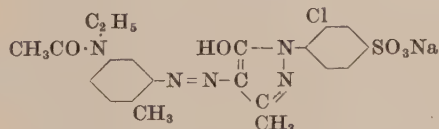
Discoverers — E. Fischer and H. Henke 1938
Supranol Yellow 4G (IG)
I.G., GP 731677 (Fr.-Bayer, I-1, 621)
BIOS MISC. 20, Appendix No. 62



o-[*p*-(1,1,3,3-Tetramethylbutyl)phenoxy]aniline
→ 1-(2-Chloro-5-sulfophenyl)-3-methyl-5-pyrazolone

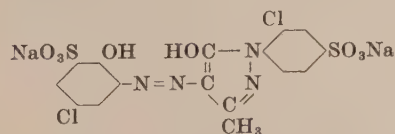
18915 C.I. Acid Yellow 53 (Yellow)

Discoverer — H. Clingstein 1922
Bayer Co., BP 216971; USP 1483415; FP 565100; GP 409281,
(Fr. 14, 954)
FIAT 764 — Supramingelb 3G



3-Amino-*N*-ethyl-*p*-acetotoluidide
→ 1-(2-Chloro-4-sulfophenyl)-3-methyl-5-pyrazolone

Soluble in water and ethanol (greenish yellow)
H₂SO₄ conc. — greenish yellow; on dilution — greenish yellow
Aqueous solution + HCl conc. — greenish yellow;
+ NaOH conc. — greenish yellow

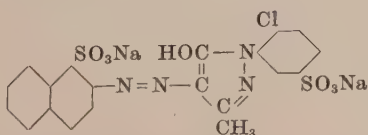
18920 C.I. Mordant Red 41 (Dull yellowish red)

6-Amino-4-chloro-1-phenol-2-sulfonic acid
→ 1-(2-Chloro-4-sulfophenyl)-3-methyl-5-pyrazolone

Soluble in water (orange red)
H₂SO₄ conc. — orange red; on dilution — yellow solution and ppt.
HCl — yellow solution

18930 Acid Dye

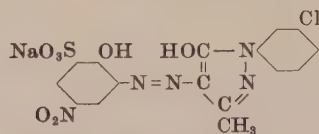
Supramine Yellow S (IG)
FDX 885 — Supramingelb S



Tobias acid → 1-(2-Chloro-5-sulfophenyl)-3-methyl-5-pyrazolone

18940 C.I. Mordant Orange 4 (*Dull reddish orange*)

BIOS 1359, 117
FIAT 764 — Chromechtorange 3RL

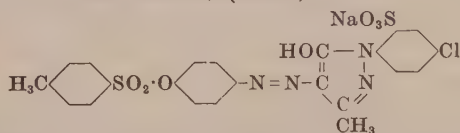


6-Amino-4-nitro-1-phenol-2-sulfonic acid
→ 1-(*m*-Chlorophenyl)-3-methyl-5-pyrazolone

Soluble in water (orange)
H₂SO₄ conc. — yellow; on dilution — yellow solution and ppt.
Aqueous solution + H₂SO₄ 10% — yellow;
+ NaOH 10% — orange

18950 C.I. Acid Yellow 40 (*Yellow*)

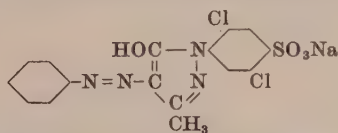
Discoverer — B. Richard 1912
Geigy, BP 26908/13; USP 1067881; FP 450866; GP 270831
(Fr. 11, 391)



p-Aminophenol
→ 1-(4-Chloro-2-sulphophenyl)-3-methyl-5-pyrazolone;
then treat with *p*-toluenesulfonyl chloride to esterify the phenolic hydroxy group

Soluble in water (yellow) and Cellosolve
Slightly soluble in ethanol and acetone
Insoluble in other organic solvents
H₂SO₄ conc. — yellow; on dilution — yellow
HNO₃ conc. — yellow solution
HCl conc. — yellow solution
NaOH 10% — yellow solution

18960 C.I. Acid Yellow 14 (*Bright yellow*)

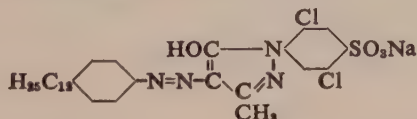


Aniline → 1-(2,5-Dichloro-4-sulphophenyl)-3-methyl-5-pyrazolone

Soluble in water (yellow)
Slightly soluble in ethanol and acetone
Insoluble in toluene
H₂SO₄ conc. — bright orange
HNO₃ conc. — bright orange

18961 C.I. Acid Yellow 72 (*Greenish yellow*)

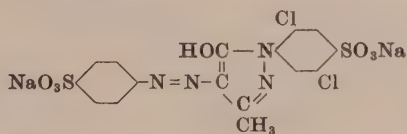
Hadfield & Lemin, JSDC 77 (1961) 97-106
BP 443 835



p-Dodecylaniline → 1-(2,5-Dichloro-4-sulphophenyl)-3-methyl-5-pyrazolone

18965 C.I. Acid Yellow 17 (*Bright yellow*)
C.I. Food Yellow 5 (*Bright yellow*)

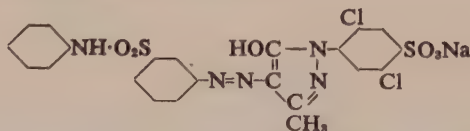
Discoverer — M. Böniger 1908
Sandoz, BP 3373/08, 12787/08; USP 901675; FP 387245;
GP 222405 (Fr. 9, 1183), 225319 (Fr. 10, 799)
Meyer, Chim. et Ind. 2 (1919), 785



Sulfanilic acid
→ 1-(2,5-Dichloro-4-sulphophenyl)-3-methyl-5-pyrazolone

Soluble in water (greenish yellow) and Cellosolve
Slightly soluble in ethanol and acetone
Insoluble in other organic solvents
H₂SO₄ conc. — greenish yellow; on dilution — not ppt.
HNO₃ conc. — reddish yellow solution
Aqueous solution + HCl — unaltered;
+ NaOH — scarcely altered;
+ Sulfoxylate-formaldehyde — decolorised, but a reddish violet colour develops when the solution is reoxidised by air

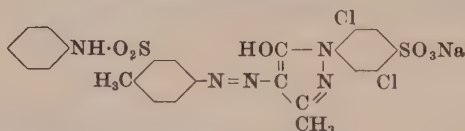
18969 C.I. Acid Yellow 172 (*Yellow*)



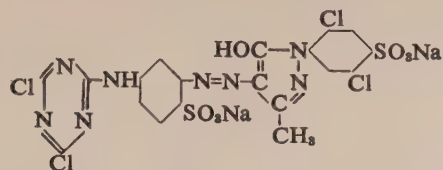
Metanilanilide → 1-(2,5-dichloro-4-sulphophenyl)-3-methyl-5-pyrazolone.

18970 C.I. Acid Yellow 48 (*Yellow*)

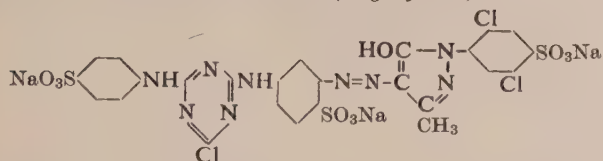
Diazo component and similar dyes —
Bayer Co., BP 12205/09; USP 965882; FP 414294; GP 226239,
230594, (Fr. 10, 806, 807)



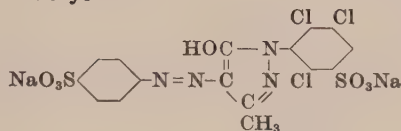
5-Amino-*o*-toluenesulfonamylide
→ 1-(2,5-Dichloro-4-sulphophenyl)-3-methyl-5-pyrazolone

18971 C.I. Reactive Yellow 1 (Bright greenish yellow)

Călin, Săndulescu, Rosenberg and Tibrea, *Coloristica Buletin Informativ*, **4** (No. 11, 1968) 179-200
Lukos & Ornaf, *Barwniki Reaktywne*, Warsaw, Wydawnictwo Przemysłu Lekkiego i Spozywczego, 1966

18972 C.I. Reactive Yellow 2 (Bright yellow)

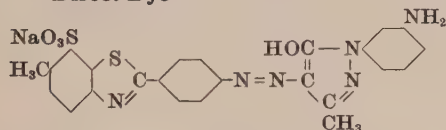
Panchartek, Allan and Mužík, *Coll. Czech. Chem. Commun.*, **25** (1960) 2783-2799
Austrian Pat. 201,745

18980 Acid Dye

Sulfanilic acid
→ 1-(2,3,6-Trichloro-5-sulfophenyl)-3-methyl-5-pyrazolone

Discoverer — W. Bergdolt (Bayer Co.) 1923
Supra Light Yellow GL (By)

Soluble in water
Moderately soluble in ethanol (greenish yellow)
H₂SO₄ conc. — greenish yellow; on dilution — greenish yellow
Aqueous solution + HCl conc. — greenish yellow;
+ NaOH conc. — greenish to golden yellow

19000 Direct Dye

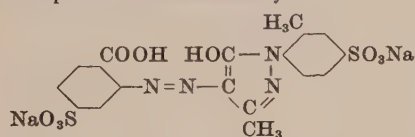
Dehydrothio-*p*-toluidinesulfonic acid
→ 3-Methyl-1-(*m*-nitrophenyl)-5-pyrazolone;

then reduce the nitro group with sodium sulfide

Zambesi Orange R (A)
FIAT 764 — Sambesiorange R

19010 C.I. Acid Yellow 54 (Yellow)

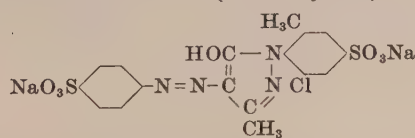
A chromium complex of the monoazo dye



4-Sulfoanthranilic acid → 3-Methyl-1-(4-sulfo-*o*-tolyl)-5-pyrazolone;
then convert to the chromium complex by heating with chromium formate in aqueous solution under pressure

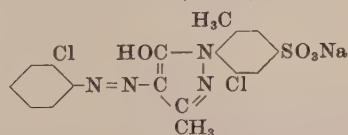
Discoverers — F. Straub, E. Brunner, and W. Widmer 1932
Ciba, *BP* 408491; *USP* 2048898; *FP* 758263; *Sw.P* 163542;
GP 588523 (*Fr.* 20, 1178)
BIOS 1548, 18
FIAT 764 — Palatinechtgelb ELN

H₂SO₄ conc. — yellow solution; on dilution — yellow solution

19020 C.I. Acid Yellow 18 (Greenish yellow)

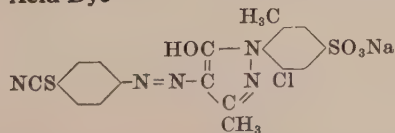
Sulfanilic acid → 1-(6-Chloro-4-sulfo-*o*-tolyl)-3-methyl-5-pyrazolone

BIOS 961, 102
FIAT 764 — Anthralangelb G; Echtlichtgelb E2G

19025 C.I. Acid Yellow 41 (Yellow)

o-Chloroaniline → 1-(6-Chloro-4-sulfo-*o*-tolyl)-3-methyl-5-pyrazolone

FIAT 764 — Flavazin E3GL

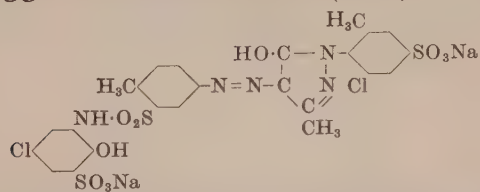
19030 Acid Dye

p-Thiocyanoaniline
→ 1-(6-Chloro-4-sulfo-*o*-tolyl)-3-methyl-5-pyrazolone

Supranol Yellow 57393 (IG)
FIAT 764 — Supranolgelb 57393

19035 C.I. Mordant Yellow 35 (Yellow)

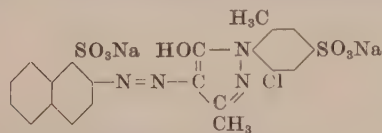
For similar dyes see —
 Bayer Co., GP 282889 (Fr. 12, 327)
 FIAT 764 — Saeurechromgelb GL



6-(5-Amino-*o*-tolylsulfonamido)-4-chloro-1-phenol-2-sulfonic acid
 → 1-(6-Chloro-4-sulfo-*o*-tolyl)-3-methyl-5-pyrazolone

19040 C.I. Acid Yellow 55 (Bright yellow)

FIAT 764 — Echtlichtgelb X



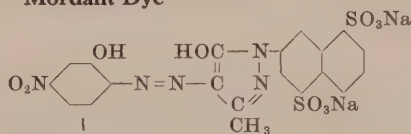
Tobias acid → 1-(6-Chloro-4-sulfo-*o*-tolyl)-3-methyl-5-pyrazolone

19050 Mordant Dye

Discoverer — P. Volkmann 1907

Diamond Red G (By)

Applicable both on a chrome mordant and as an afterchrome dye
 Bayer Co., BP 11866/08; USP 902186; FP 391456; GP 221696 (Fr. 9, 1185)



2-Amino-5-nitrophenol
 → 1-(4,8-Disulfo-2-naphthyl)-3-methyl-5-pyrazolone

Soluble in water (orange brown)

Moderately soluble in ethanol

H₂SO₄ conc. — golden yellow; on dilution — greenish yellow

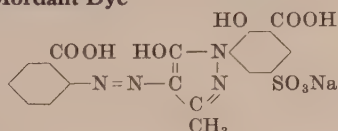
Aqueous solution + HCl conc. — greenish yellow;

+ NaOH conc. — magenta red

19060 Mordant Dye**Acid Alizarine Flavine GF (IG)**

BIOS 961, 57

FIAT 764 — Saeurealizarinflavine GF

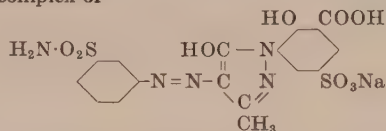


Anthranilic acid
 → 1-(3-Carboxy-2-hydroxy-5-sulfo-2-naphthyl)-3-methyl-5-pyrazolone

19065 Acid Dye**Palatine Fast Yellow 5GN, GNO (IG)**

FIAT 1313, 2, 251 Palatinechtgelb 5GN, GNO

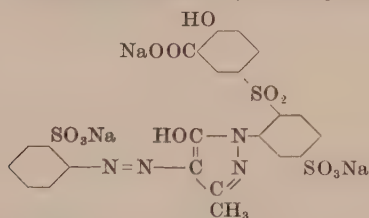
A chromium complex of



Metanilamide
 → 1-(3-Carboxy-2-hydroxy-5-sulfo-2-naphthyl)-3-methyl-5-pyrazolone;
 then convert to the chromium complex

19070 C.I. Mordant Yellow 45 (Greenish yellow)

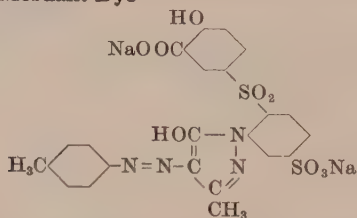
Discoverers — H. Schweitzer and W. Neelmeier 1925
 I.G., BP 245765; FP 608966; GP 436790 (Fr. 15, 491)
 BIOS 961, 60
 FIAT 764 — Saeurechromgelb 3GL



o-Aminobenzenesulfonic acid
 → 5-[2-(3-Methyl-5-oxo-2-pyrazolin-1-yl)-4-sulfo-2-naphthylsulfonyl]-salicylic acid

19075 Mordant Dye**Chroming Yellow 2GL (IG)**

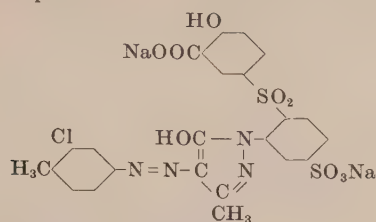
FIAT 764 — Chromierungsgelb 2GL



p-Toluidine
 → 5-[2-(3-Methyl-5-oxo-2-pyrazolin-1-yl)-4-sulfo-2-naphthylsulfonyl]salicylic acid

19080 Acid Dye

A chromium complex of

3-Chloro-*p*-toluidine

→ 5-[2-(3-Methyl-5-oxo-2-pyrazolin-1-yl)-4-sulfophenylsulfonfyl]salicylic acid

Discoverer — H. Schweitzer 1928

Palatine Fast Yellow 6GN (IG)Dyes wool from a sulfuric acid bath; levelling — good
Fastness Properties: Light, very good; Milling (alkaline) good; Perspiration, good; Washing, fairly good

Also dyes silk

I.G., BP 306843; USP 1794252; FP 669994; GP 537020 (Fr. 18, 972)

I.G., BP 347290; GP 538668 (Fr. 18, 973)

FIAT 764 — Palatinechtgelb 6GN

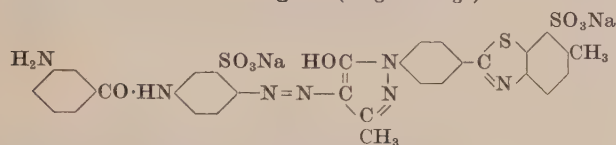
Moderately soluble in water

Slightly soluble in ethanol (greenish yellow)

H₂SO₄ conc. — greenish yellow; on dilution — greenish yellow

Aqueous solution + HCl conc. — greenish yellow;

+ NaOH conc. — greenish yellow

19100 C.I. Direct Orange 84 (Bright orange)*2-Amino-5-(*m*-nitrobenzamido)benzenesulfonic acid→ 6-Methyl-2-[*p*-(3-methyl-5-oxo-2-pyrazolin-1-yl)phenyl]-7-benzothiazolesulfonic acid;

then reduce the nitro group to amino with sodium sulfide

* Developed with 2-naphthol

Discoverers — A. Zart and H. Schweitzer 1913

Bayer Co., BP 26236/13; USP 1114844; FP 465794; GP 273280 (Fr. 12, 338)

FIAT 764 — Diazobrillantorange 5G ex.

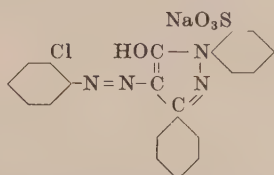
Soluble in water (brownish orange)

Slightly soluble in ethanol (golden yellow)

H₂SO₄ conc. — greenish yellow; on dilution — golden yellow

Aqueous solution + HCl conc. — golden orange ppt;

+ NaOH conc. — golden yellow, ppt.

19110 C.I. Acid Yellow 122 (Yellow)*o*-Chloroaniline → 3-Phenyl-1-(*o*-sulfophenyl)-5-pyrazolone

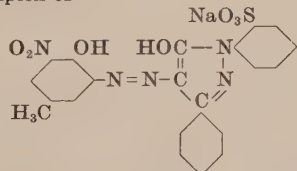
Discoverers — H. Kracker and R. Schmid 1933; E. Fischer 1935

I.G., BP 448131; USP 2015225; FP 782204; GP 648012 (Fr. 24, 707), GP 735076

FIAT 764 — Igelangelb RR

19115 C.I. Acid Red 198 (Red)

A chromium complex of

2-Amino-6-nitro-*p*-cresol → 3-Phenyl-1-(*o*-sulfophenyl)-5-pyrazolone;

then heat with chromium formate in aqueous solution for 4 hr. commencing at 115°C and rising to 125°C to convert to the chromium complex

Discoverers — H. Kracker and R. Schmid 1933

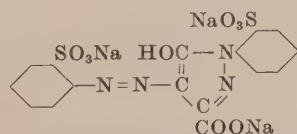
E. Fischer 1934

I.G., BP 444820; USP 2040368; FP 792845; GP 652869 (Fr. 24, 700)

For unchromed dye see patents cited under C.I.19110

FIAT 764 — Palatinechtrot LBN

(Note—Constitution given in BIOS 961, 73 is apparently incorrect)

19120 C.I. Acid Yellow 13 (Bright greenish yellow)**19120:1 C.I. Solvent Yellow 15 (Greenish yellow)***o*-Aminobenzenesulfonic acid→ 3-Carboxy-1-(*o*-sulfophenyl)-5-pyrazolone

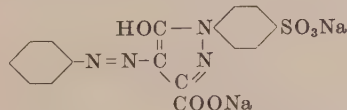
C.I. 19120:1 is the dicyclohexylamine salt

Discoverer — M.L.B. 1905

Compare GP 175290, 176954, (Fr. 8, 558)

BIOS 961, 25

FIAT 764 — Echtlichtgelb 3G

19130 C.I. Acid Yellow 27 (Yellow)Aniline → 3-Carboxy-1-(*p*-sulfophenyl)-5-pyrazolone

M.L.B., BP 2622/06; FP 371987; GP 175290, 176954, (Fr. 8, 558, 558)

BIOS 961, 30

FIAT 764 — Flavazin S

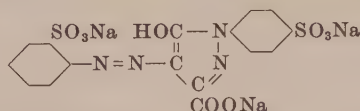
Meyer, *Chim. et Ind.* 2 (1919), 785Cross, *JSDC*, 61 (1945), 75

Soluble in water, ethanol and acetone (yellow)

H₂SO₄ conc. — brownish yellow; on dilution — redder, then brownish yellow flocculent ppt.

Aqueous solution + HCl conc. — brownish yellow ppt;

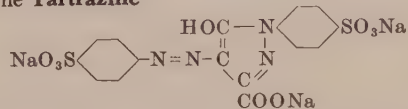
+ NaOH — paler

19135 Acid Dye

o-Aminobenzenesulfonic acid
→ 3-Carboxy-1-(*p*-sulfophenyl)-5-pyrazolone

19140 C.I. Acid Yellow 23 (Yellow)

C.I. Food Yellow 4 (Yellow)

19140:1 C.I. Pigment Yellow 100 (Greenish yellow)Classical name **Tartrazine**(a) Sulfanilic acid → 3-Carboxy-1-(*p*-sulfophenyl)-5-pyrazolone(b) React *p*-hydrazinobenzenesulfonic acid (2 mol.) with dioxo-succinic acid

C.I. 19140:1 is the aluminium salt

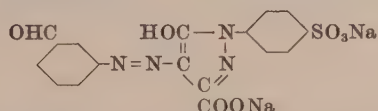
Soluble in water (yellow)

Slightly soluble in ethanol and Cellosolve

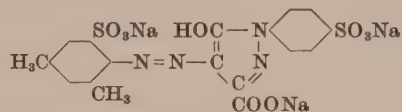
Insoluble in other organic solvents

 H_2SO_4 conc. — yellow; on dilution — yellow solution HNO_3 conc. — yellow solution

Aqueous solution + HCl — unaltered; + NaOH conc. — redder yellow

19145 Acid Dye*m*-Aminobenzaldehyde → 3-Carboxy-1-(*p*-sulfophenyl)-5-pyrazolone H_2SO_4 conc. — brownish yellow; on dilution — cloudy yellow

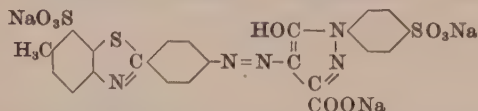
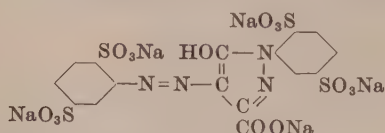
Aqueous solution + HCl — yellow ppt; + NaOH — yellow

19150 Acid Dye

2-Amino-3,5-xylenesulfonic acid

→ 3-Carboxy-1-(*p*-sulfophenyl)-5-pyrazolone H_2SO_4 conc. — orange; on dilution — yellow

Aqueous solution + HCl — unaltered; + NaOH — little darker

19160 C.I. Direct Orange 17 (Bright yellowish orange)Dehydrothio-*p*-toluidinesulfonic acid→ 3-Carboxy-1-(*p*-sulfophenyl)-5-pyrazolone*Note* — In some brands dehydrothio-*p*-toluidinesulfonic acid is replaced wholly or partly by primuline (C.I.49000), e.g. Igenal Orange CG**19170 Dye for Pigments (Bright greenish yellow)***2-Amino-*p*-benzenedisulfonic acid

→ 3-Carboxy-1-(2,5-disulfophenyl)-5-pyrazolone

* Barium salt

Fast Light Yellow GGT (IG)

FIAT 764 — Echtlichtgelb GGT

Discoverer — H. Ziegler 1884

Badische Co., BP 9858/85; USP 324630; FP 169964; GP 34294

(Fr. 1, 558) BP 5693/93, 765/97; GP ap. B20084 (Fr. 5, 502)

Bennert, BP 8504/87; GP ap. B8432 (Fr. 2, 476)

BIOS 961, 65

FIAT 764 — Tartrazin O

Knecht, JSDC, 2 (1886), 24; 7 (1891), 58

Tagel, Ber. 20 (1887), 244

Ziegler & Locher, Ber. 20 (1887), 834

Richardson, JSDC, 3 (1887), 2

Knorr, Ber. 21 (1888), 1204

Anschütz, Ann. 294 (1896), 232; 306 (1899), 1

Bernthsen, Chem. Z. 22 (1898), 456

Gnehm & Benda, Ann. 299 (1898), 127

Schmidt, J. prakt. Chem. 85 (1912), 235

Rev. Prod. Chim. 20 (1917), 22

Meyer, Chim. et Ind. 2 (1919), 781

Johnson, JSCI, 40 (1921), 176T

Whitmore & Revukas, JACS, 59 (1937), 1501

Discoverer — K. Thiess 1923

Amido Fast Yellow R (MLB)

Dyes wool from a weakly acid or neutral bath; levelling — good

Fastness Properties (C): Light 4, Milling (alkaline) 2–3, Perspiration 3, Washing 3

Also dyes silk from a degumming liquor in the presence of acetic acid

Also suitable for direct and discharge printing

M.L.B., BP 205503; USP 1540664; FP 573603; GP 409563 (Fr. 15, 476)

Soluble in water (yellow)

Moderately soluble in ethanol

Normal Yellow 3GL (MLB)

Dyes wool from a sulfuric acid bath; levelling — good

Fastness Properties (C): Light 6, Milling (alkaline) 1–2, Perspiration 3, Washing 2

Also dyes silk from a degumming liquor in the presence of acetic, formic or sulfuric acid

Also suitable for direct and discharge printing

M.L.B., BP 2622/06; FP 371987; GP 175290, 176954, (Fr. 8, 558, 558)

Meyer, Chim. et Ind. 2 (1919), 785

Soluble in water (yellow)

Partially soluble in ethanol (yellow)

Discoverer — F. Scholl 1899

M.L.B., BP 10127/00; USP 656858; FP 300890; GP 117575 (Fr. 6, 1010)

FIAT 764 — Dianilorange G

Meyer, Chim. et Ind. 2 (1919), 785

(Note — Igenal Orange CG and SJU (IG) were brands for leather)

Soluble in water (orange yellow)

 H_2SO_4 conc. — reddish yellow; on dilution — orange

Aqueous solution + HCl — orange; + NaOH — redder

Discoverer — M.L.B.

Saturn Yellow 5GL (MLB)

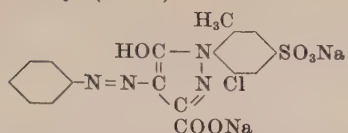
The barium salt is a bright greenish yellow pigment used for printing inks and wallpaper colouring

For similar dyes see —

GP 175290, 176954, (Fr. 8, 558)

BIOS 961, 55

FIAT 764 — Saturngelb 5GL

19180 Acid Dye (Yellow)

Aniline → 3-Carboxy-1-(6-chloro-4-sulfo-*o*-tolyl)-5-pyrazolone

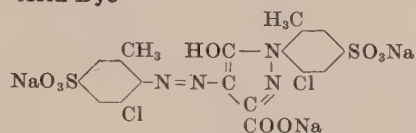
Discoverer — M.L.B.

Flavazine 4G (MLB)

Dyes wool from a sulfuric acid dyebath greenish yellow shades

Fastness Properties: Light (C) 4, Alkaline milling 1, Washing 3

FIAT 764 — Flavazin 4G

19185 Acid Dye

4-Amino-5-chloro-*m*-toluenesulfonic acid
→ 3-Carboxy-1-(6-chloro-4-sulfo-*o*-tolyl)-5-pyrazolone

Discoverers — P. Julius and E. Fussenegger 1909

Radial Yellow G, 3G (B)

The barium salt was formerly used as a greenish yellow pigment

Fastness Properties: Oil, Spirit and Light, good; Water, moderate

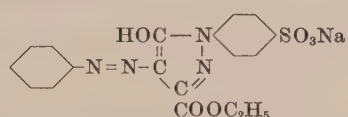
Badische Co., *BP ap.* 1245/09; *USP* 935370; *GP* 229525 (*Fr.* 10, 797)

Soluble in water (yellow)

Slightly soluble in hot ethanol

H₂SO₄ conc. — yellow; on dilution — unaltered

Aqueous solution + HCl — unaltered; + NaOH — orange yellow

19200 Acid Dye

Aniline → 3-Carbethoxy-1-(*p*-sulphophenyl)-5-pyrazolone

Discoverers — H. Eichwede and E. Fischer 1924

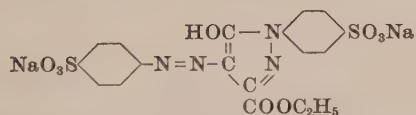
Flavazine SL (IG)

Dyes wool from a sulfuric acid bath; levelling—good
Fastness Properties (C): Light 5, Milling (alkaline) 1, Perspiration 3

Also dyes silk from a degumming liquor in the presence of acetic, formic or sulfuric acid

Also suitable for direct and discharge printing of wool and silk

I.G., *BP* 243758; *USP* 1766813, 1819547; *GP* 493128 (*Fr.* 16, 1030)

19205 Acid Dye

Sulfanilic acid → 3-Carbethoxy-1-(*p*-sulphophenyl)-5-pyrazolone

Discoverers — H. Eichwede and E. Fischer 1924

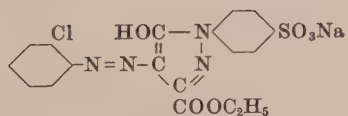
Flavazine TL (IG)

Dyes wool from a sulfuric acid bath; levelling—good
Fastness Properties (C): Light 5, Milling (alkaline) 1, Perspiration 3

Also dyes silk from a degumming liquor in the presence of acetic, formic or sulfuric acid

Also suitable for direct and discharge printing of wool and silk

I.G., *BP* 243758; *USP* 1766813, 1819547; *GP* 493128 (*Fr.* 16, 1030)

19210 Acid Dye

o-Chloroaniline → 3-Carbethoxy-1-(*p*-sulphophenyl)-5-pyrazolone

Discoverers — H. Eichwede and E. Fischer 1924

Gloria Yellow G (IG)

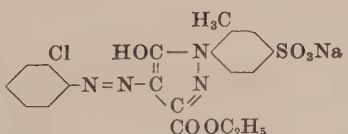
Dyes wool from a sulfuric acid bath; levelling—good
Fastness Properties (C): Light 4–5, Milling (alkaline) 1–2, Perspiration 2–3, Washing 2

Also dyes silk from a degumming liquor in presence of acetic, formic or sulfuric acid

Also suitable for direct or discharge printing of wool and silk

I.G., *BP* 243758; *USP* 1766813, 1819547; *GP* 493128 (*Fr.* 16, 1030)

FIAT 764 — Wollseidengelb G

19220 Acid Dye

o-Chloroaniline → 3-Carbethoxy-1-(4-sulfo-*o*-tolyl)-5-pyrazolone

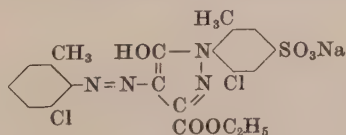
Discoverers — H. Eichwede and E. Fischer 1924

Gloria Yellow 3G (IG)

Dyes wool from a sulfuric acid bath; levelling—moderate
Fastness Properties (C): Light 4–5, Milling (alkaline) 2, Perspiration 2–3, Washing 2

Also dyes silk from a degumming liquor in presence of sulfuric acid

I.G., *BP* 243758; *USP* 1766813, 1819547; *GP* 493128 (*Fr.* 16, 1030)

19230 C.I. Acid Yellow 153 (Greenish yellow)

6-Chloro-*o*-toluidine
→ 3-Carbethoxy-1-(6-chloro-4-sulfo-*o*-tolyl)-5-pyrazolone

Discoverers — E. Eichwede and E. Fischer 1924

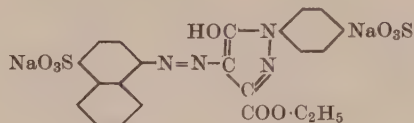
The barium salt is a bright greenish yellow pigment used for printing inks and wallpaper colouring. The unlaked dye colours paper bright greenish yellow

I.G., *BP* 243758; *USP* 1766813, 1819547; *GP* 493128 (*Fr.* 16, 1030)

FIAT 764 — Saturngelb GG

19235 C.I. Acid Orange 137 (Dull orange)

Discoverer—Stange Co.
Stange Co. USP 3285906

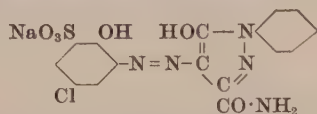


H₂SO₄ conc.—violet, on dilution fuchsine then red
HCl conc. —red
NaOH 10% —yellowish orange, on dilution brownish yellow

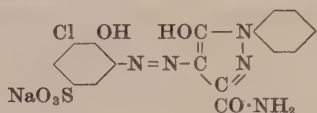
React phenylhydrazine-*p*-sulfonic acid with the sodium derivative of diethyl hydroxymaleate, partially hydrolyse, to remove one ethyl group, then couple with diazotised naphthionic acid

19240 C.I. Mordant Red 71 (Bluish red)

BIOS 961, 56
FIAT 764 — Saeurealizarinbordo B



6-Amino-4-chloro-1-phenol-2-sulfonic acid
→ 3-Carbamoyl-1-phenyl-5-pyrazolone

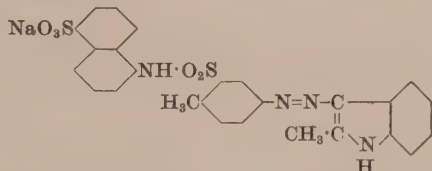
19245 Mordant Dye (Bright yellowish red)**Acid Alizarine Red GN (IG)**

Afterchrome dye for fast to wearing and processing dyeings in loose wool, slubbing and yarns, where fastness to heavy milling not needed
Fastness Properties (C): Carbonising 4-5, Decatising 4-5, Light 7, Milling 4-5, Perspiration 5, Potting 3-4
Very sensitive to copper and iron in the dyebath
Reserves cotton and viscose rayon effects
FIAT 764 — Saeurealizarinrot GN
I.G. Wool Manual

2-Amino-6-chloro-1-phenol-4-sulfonic acid
→ 3-Carbamoyl-1-phenyl-5-pyrazolone

19300 Acid Dye

Discoverers — O. Dressel, R. Kothe, and H. Hörlein 1909
Supramine Yellow G (IG)



Dyes wool from a neutral or acid bath; levelling—moderate
Fastness Properties (C): Light 4, Milling (alkaline) 2-3, Perspiration 4, Washing 3
Suitable for dyeing unions owing to its good affinity from a neutral bath. Also dyes silk
Bayer Co., BP 15847/09; USP 978438-9; FP 414294; GP 226240 (Fr. 10, 807)
FIAT 764 — Supramingelb G
Venkataraman, 433

5-(5-Amino-*o*-tolylsulfonamido)-1-naphthalenesulfonic acid
→ 2-Methylindole

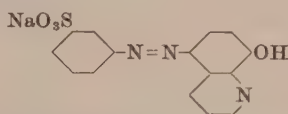
Aqueous solution + HCl conc. — greenish yellow;
+ NaOH conc. — greenish yellow

Soluble in water and ethanol (greenish yellow)
H₂SO₄ conc. — greenish yellow; on dilution — greenish yellow

19320 C.I. Acid Orange 61 (Orange)

Discoverers — H. Krzikalla and W. Limbacher 1932
I.G., BP 406778; USP 1991808; FP 758069; GP 590190 (Fr. 20, 1193)
FIAT 764 — Erganilorange GGC

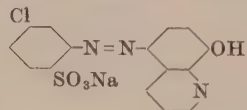
A chromium complex of



Metanilic acid → 8-Quinolinol;
then heat with chromium formate in aqueous solution for 4 hr. at 100°C
to convert to the complex

19325 C.I. Mordant Orange 26 (Orange)

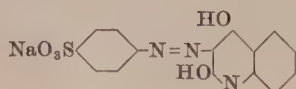
BIOS 961, 19
FIAT 764 — Chromechtorange G



2-Amino-4-chlorobenzenesulfonic acid → 8-Quinolinol

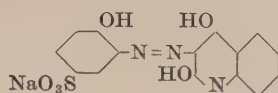
19340 Acid Dye

Discoverer — E. Fussenegger 1904
Quinazol Yellow (B)



Used formerly for colouring paper
Badische Co., BP 11205/05; USP 806077; FP 355146; GP 117167 (Fr. 6, 1224), GP 165327 (Fr. 8, 718)

Sulfanilic acid → 2,4-Quinolidiol

19345 Mordant Dye

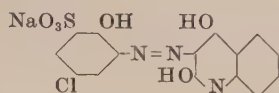
2-Amino-1-phenol-4-sulfonic acid → 2,4-Quinolinediol

Discoverers — J. Jansen and W. Neelmeier 1909

Chrome Fast Garnet BLT (By)

An afterchrome dye

Bayer Co., BP 28716/09; USP 961355; FP 410116; GP 222992 (Fr. 10, 859)

19350 Mordant Dye

6-Amino-4-chloro-1-phenol-2-sulfonic acid → 2,4-Quinolinediol

Discoverers — J. Jansen and W. Neelmeier 1909

Diamond Red 5B (By)

An afterchrome dye

Bayer Co., BP 28716/09; USP 961355; FP 410116; GP 222992 (Fr. 10, 859)

Soluble in water and ethanol (golden yellow)

H₂SO₄ conc. — reddish orange brown; on dilution — greenish yellow

Aqueous solution + HCl conc. — greenish yellow;
+ NaOH conc. — orange

19351 C.I. Acid Red 179 (Bluish red)

A chromium complex of C.I.19350

Heat C.I.19350 with chromium formate in aqueous solution for 2–3 hr. at 125°C

Discoverers — H. Kammerer and K. Holzach 1927

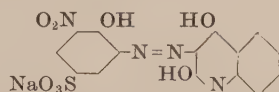
I.G., BP 310343; FP 656050; GP 483651 (Fr. 16, 977)

BIOS 961, 71. BIOS 1548, 26

FIAT 764 — Palatinechtbordo RN

19355 C.I. Acid Red 214 (Red)

A chromium complex of



2-Amino-6-nitro-1-phenol-4-sulfonic acid → 2,4-Quinolinediol;
then heat with chromium sulfate in aqueous solution for 2 hr. at 125°C

Discoverers — H. Kammerer and K. Holzach 1927

I.G., BP 297722; FP 638772; GP 483651 (Fr. 16, 978)

BIOS 961, 73

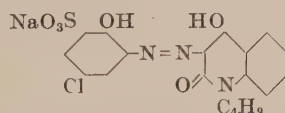
FIAT 764 — Palatinechtrot BEN

Soluble in water (bordeaux)

Insoluble in ethanol and acetone

H₂SO₄ conc. — reddish brown; on dilution — bluish red

Aqueous solution + H₂SO₄ 10% — slightly bluer;
+ NaOH 10% — no change

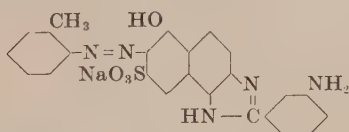
19360 C.I. Mordant Red 30 (Dull bluish red)

6-Amino-4-chloro-1-phenol-2-sulfonic acid
→ 1-Butyl-4-hydroxycarbostyryl

Discoverers — K. Holzach and G. v. Rosenberg 1928

I.G., BP 327380; USP 1893646; FP 677491; GP 537223 (Fr. 18, 1029)

FIAT 764 — Metachrombordo BL

19500 C.I. Direct Red 142 (Bright red)*

o-Toluidine

→ 2-(*m*-Aminophenyl)-6-hydroxy-
1H-naphth[1,2]imidazole-8-sulfonic acid

* Developed with 2-naphthol

Discoverers — K. Krekeler and A. Blank 1904

Bayer Co., BP 1675/05; USP 792600; FP 353273; GP 172319 (Fr. 8, 696)

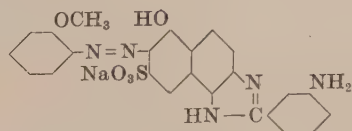
Agfa, BP 24518/06; FP 361883; GP 193350 (Fr. 9, 182)

FIAT 764 — Sambesirost 4B

Soluble in water (red) and ethanol (orange red)

H₂SO₄ conc. — magenta; on dilution — red

Aqueous solution + HCl conc. — red;
+ NaOH conc. — orange brown ppt.

19505 Direct Dye

o-Anisidine

→ 2-(*m*-aminophenyl)-6-hydroxy-
1H-naphth[1,2]imidazole-8-sulfonic acid

Aqueous solution + HCl conc. — reddish violet ppt;
+ NaOH conc. — orange brown ppt.

Discoverers — K. Krekeler and A. Blank 1904

Zambesi Red 8B (A)

Fastness Properties (C), developed with 2-naphthol: Acid (organic) 3–4, Alkali 5, Light 2, 2, 3, Washing 2–3, Water 3

Dischargeability: neutral and alkaline, poor–fair

Bayer Co., BP 1675/05; USP 792600; FP 353273; GP 172319 (Fr. 8, 696)

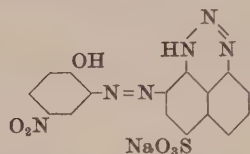
Agfa, BP 24518/06; FP 361883; GP 193350 (Fr. 9, 182)

FIAT 764 — Sambesirost 8B

Schedler, JSCI, 41 (1925), 397

Soluble in water (bluish red) and ethanol

H₂SO₄ conc. — violet; on dilution — pink to magenta

19510 Mordant Dye (Bluish green)

2-Amino-4-nitrophenol → 4,5-Diamino-1-naphthalenesulfonic acid;
and treat with nitrous acid to form the triazine

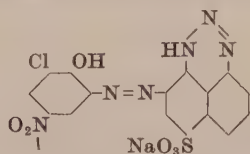
Aqueous solution + HCl conc. — orange brown;
+ NaOH conc. — violet black

Discoverer — Cassella Co. 1901

Metachrome Green BB (By)

Gives metachrome dyeings of good to very good fastness to most agencies. Dischargeable to white. Prints on wool mordanted with chrome acetate have good fastness to washing
Cassella Co., BP 26147/01; FP 316866, 328086; GP 139908 (Fr. 6, 931)
M.L.B., BP 953/03; USP 741552; FP 336387; GP 143387 (Fr. 7, 388)
FIAT 764 — Metachromgruen BB

Soluble in water (corinth)
Moderately soluble in ethanol (bordeaux)
H₂SO₄ conc. — deep blue; on dilution — orange brown

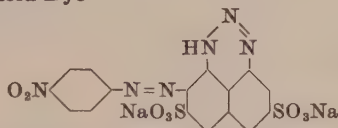
19515 C.I. Mordant Green 9 (Dull bluish green)

2-Amino-6-chloro-4-nitrophenol
→ 4,5-Diamino-1-naphthalenesulfonic acid;
then treat with nitrous acid to form the triazine

Discoverers — J. Jansen and W. Neelmeier 1909

Bayer Co., BP 9908/09; USP 961354; FP 410718; GP 222928 (Fr. 10, 857)
FIAT 764 — Saeurechromgruen G

Soluble in water (bordeaux to corinth)
Moderately soluble in ethanol (violet)
H₂SO₄ conc. — greenish blue; on dilution — orange red brown
Aqueous solution + HCl conc. — orange red brown;
+ NaOH conc. — violet black

19520 Acid Dye

p-Nitroaniline → 4,5-Diamino-2,7-naphthalenedisulfonic acid;
then treat with nitrous acid to form the triazine

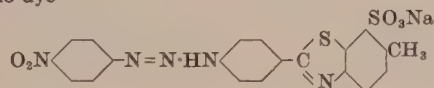
Brilliant Wool Scarlet (K)

Dyes wool from an acid bath; levelling—good
Cassella Co., BP 24714/93; FP 234837; GP 77425 (Fr. 4, 766)

Soluble in water (magenta red)
H₂SO₄ conc. — blue; on dilution — violet red
Aqueous solution + HCl — bluish red; + NaOH — blue

19530 Direct Dye

Diazoamino dye



p-Nitroaniline → Dehydrothio-*p*-toluidinesulfonic acid

Discoverer — C. Dreyfus 1893

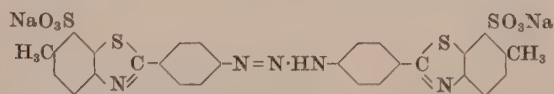
Nitrophenine (CAC)

Dyes cotton greenish yellow. Of poor fastness to acids, alkali and light. Dischargeability, poor
BP 24870/93
JSDC, 10 (1894), 107

Soluble in water (reddish yellow)
Insoluble in ethanol
H₂SO₄ conc. — golden yellow; on dilution — yellow ppt.
Aqueous solution + HCl — yellow ppt;
+ NaOH — dark violet ppt.

19540 C.I. Direct Yellow 9 (Yellow)

Diazoamino dye



Dehydrothio-*p*-toluidinesulfonic acid
→ Dehydrothio-*p*-toluidinesulfonic acid

In certain brands of very closely related dyes either or both molecules of dehydrothio-*p*-toluidinesulfonic acid may be replaced by Primuline (C.I.49000) or by Primuline melt total sulfonation product

The constitution of Oxydiamine Yellow TZM is dehydrothio-*p*-toluidinesulfonic acid → Primuline

Discoverer — W. Pfizinger 1889

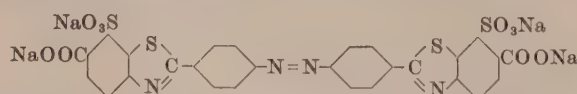
Bayer Co., BP 18354/89; USP 428629, 446009; FP 198786; GP 53935 (Fr. 2, 296)
BIOS 1548, 146
FIAT 764 — Thiazolgelb G, Oxydiamine Yellow TZM

Thiazol Yellow G

Very soluble in water and ethanol (lemon yellow)
H₂SO₄ conc. — lemon yellow; on dilution — very pale yellow
Aqueous solution + HCl conc. — golden orange ppt;
+ NaOH conc. — orange ppt.

Oxydiamine Yellow TZM

Soluble in water and ethanol (golden yellow)
H₂SO₄ conc. — golden yellow; on dilution — pale lemon yellow
Aqueous solution + HCl conc. — golden orange ppt;
+ NaOH conc. — orange brown ppt.

19550 Direct Dye

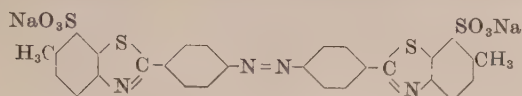
Treat an aqueous solution of the sodium salt of 2-(*p*-aminophenyl)-7-sulfo-6-benzothiazolecarboxylic acid with sodium hypochlorite

Sirius Supra Yellow GG (IG)

FIAT 764 — Siriuslichtgelb GG

19555 C.I. Direct Yellow 28 (Reddish yellow)

Usually mixed dyes of which the following is the chief component



with an azine dye also present

Treat an aqueous solution of the sodium salt of dehydrothio-*p*-toluidinesulfonic acid with sodium hypochlorite

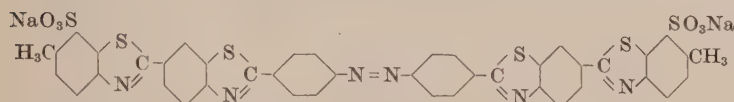
A purer form of the dye, of more greenish hue, can be obtained by fractionation from sulfuric acid, e.g. **Sirius Supra Yellow FRL (IG)**

Discoverers — Pfitzinger 1891; J. Hall and F. Moore 1892
Bayer Co., *BP* 19061/91; *FP* 216954; *GP* 65402 (*Fr.* 3, 752)
See also
Clayton Aniline, *BP* 5761/92
Cassella Co., *BP* 22914/94; *FP* 243241; *GP ap.* C5357 (*Fr.* 4, 1336)
FIAT 764 — Siriuslichtgelb RR, Siriuslichtgelb FRL
FDX 885 — Chloramingelb FF
JSDC, 8 (1892), 80, 179; 10 (1894), 186; 11 (1895), 134
Heumann, *Die Anilinfarben*, 4 (1906), 1080
Bogert & Bergheim, *Proc. Nat. Acad. Sci.* (1924), 318
Fierz-David & Brunner, *Helv. Chim. Acta*, 27 (1944), 1
Schubert, *Ann.* 558 (1947), 10

Soluble in water (golden yellow)
Slightly soluble in ethanol (lemon yellow)
 H_2SO_4 conc. — reddish brown; on dilution — yellow
Aqueous solution + HCl conc. — golden yellow;
+ NaOH conc. — golden yellow

19556 C.I. Direct Yellow 29 (Reddish yellow)

Mixed dyes with the following as chief component



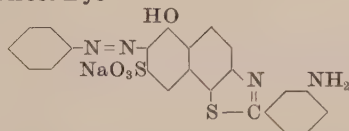
Treat an aqueous solution of Primuline (C.I.49000) with sodium hypochlorite

Instead of Primuline the Primuline melt total sulfonation product or other mixtures of Primuline and dehydrothio-*p*-toluidinesulfonic acid may be used and many commercial products therefore correspond to mixtures of C.I.19555 and C.I.19556

Discoverers — A. G. Green 1887 (on the fibre); Guinon, Piccard and Jay 1890 (in substance)
FP 209519
Other references as for C.I.19555
FIAT 764 — Siriuslichtgelb RT

Soluble in water (golden yellow)
Very slightly soluble in ethanol (pale lemon yellow)
 H_2SO_4 conc. — orange red brown; on dilution — golden yellow
Aqueous solution + HCl conc. — orange red brown;
+ NaOH conc. — golden yellow

19560 Direct Dye



Aniline
→ 2-(*m*-Aminophenyl)-6-hydroxynaphtho[2,1]thiazole-8-sulfonic acid

H_2SO_4 conc. — magenta; on dilution — red
Aqueous solution + HCl conc. — reddish brown, ppt;
+ NaOH conc. — brown ppt.

Discoverer — A. Thauss 1904

Diazo Brilliant Scarlet G Extra (By)

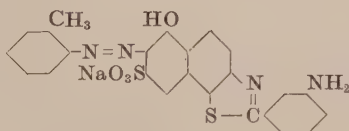
Fastness Properties (C), developed with 2-naphthol: Acid (organic) 3-4, Alkali 5, Light 2, Washing 2-3, Water 3-4

Dischargeability: neutral, poor

Bayer Co., *BP* 27843/04; *USP* 794568, 795869; *FP* 353928, 355046; *GP* 165126, 166903, (*Fr.* 8, 185, 695)
FIAT 764 — Diazobrillantscharlach G ex.

Slightly soluble in water (orange brown)
Soluble in ethanol (brownish orange)

19565 Direct Dye



o-Toluidine
→ 2-(*m*-Aminophenyl)-6-hydroxynaphtho[2,1]thiazole-8-sulfonic acid

H_2SO_4 conc. — bluish red; on dilution — pale pink
Aqueous solution + HCl conc. — bluish red ppt;
+ NaOH conc. — red ppt.

Discoverer — A. Thauss 1904

Diazo Brilliant Scarlet B Extra (By)

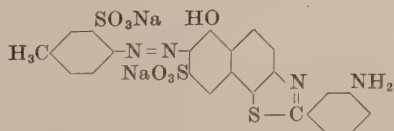
Fastness Properties (C), developed with 2-naphthol: Acid (organic) 3-4, Alkali 5, Light 2, Washing 2-3, Water 3-4

Dischargeability, neutral, poor

Bayer Co., *BP* 27843/04; *USP* 794568, 795869; *FP* 353928, 355046; *GP* 165126, 166903, (*Fr.* 8, 186, 695)
FIAT 764 — Diazobrillantscharlach B ex.
Schedler, *JSCI*, 41 (1925), 397

Soluble in water (red)
Slightly soluble in ethanol (reddish orange)

19570 Direct Dye



6-Amino-*m*-toluenesulfonic acid
→ 2-(*m*-Aminophenyl)-6-hydroxynaphtho[2,1]thiazole-8-sulfonic acid

Diazo Brilliant Scarlet BA ex. is a mixed dye consisting of C.I.19565 and C.I.19570

Discoverer — A. Thauss 1904

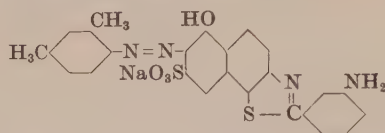
Diazo Brilliant Scarlet BA Extra (By)

Fastness Properties (C), developed with 2-naphthol: Acid (organic) 3-4, Alkali 5, Light 2, Washing 2-3, Water 3-4

Dischargeability, neutral, poor

Patents as for C.I.19565
FIAT 764 — Diazobrillantscharlach BA ex.

Soluble in ethanol (reddish orange)
Very soluble in water (red)
 H_2SO_4 conc. — bluish red; on dilution — magenta
Aqueous solution + HCl conc. — bluish red ppt;
+ NaOH conc. — red ppt.

19575 C.I. Direct Red 168 (Bright red)*

2,4-Xylidine

→ 2-(*m*-Aminophenyl)-6-hydroxynaphtho[2,1]thiazole-8-sulfonic acid

* Developed with 2-naphthol

Discoverer — A. Thauss 1904

Patents as for C.I.19565

FIAT 764 — Diazobrillantscharlach 3B ex., 3BA ex.

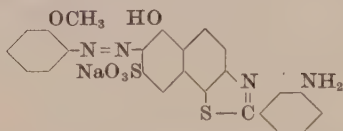
Diazo Brilliant Scarlet 3B ex. is a mixed dye from this and C.I.19565; **Diazo Brilliant Scarlet 3BA ex.** is a mixed dye from this and C.I.19570

Soluble in water (3B) red (3BA) orange brown

Slightly soluble in ethanol (reddish orange)

H₂SO₄ conc. — magenta; on dilution — (3B) paler, (3BA) reddish orange

Aqueous solution + HCl conc. — (3B) magenta ppt, (3BA) red ppt; + NaOH conc. — (3B and 3BA) orange brown ppt.

19580 Direct Dye*o*-Anisidine→ 2-(*m*-Aminophenyl)-6-hydroxynaphtho[2,1]thiazole-8-sulfonic acid

Aqueous solution + HCl conc. — bordeaux ppt;
+ NaOH conc. — orange brown ppt.

Discoverer — A. Thauss 1904

Diazo Brilliant Scarlet 6B Extra (By)

Fastness Properties (C), developed with 2-naphthol: Acid (organic) 3-4, Alkali 5, Light 2, Washing 3, Water 3-4

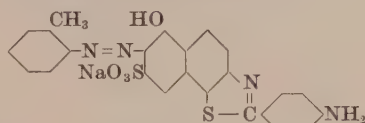
Dischargeability, neutral, poor

Patents as for C.I.19565

FIAT 764 — Diazobrillantscharlach 6B ex.

Very soluble in water (bluish red)

Soluble in ethanol (red)

H₂SO₄ conc. — violet and reddish violet; on dilution — magenta**19590 C.I. Direct Red 119 (Bluish red)****o*-Toluidine→ 2-(*p*-Aminophenyl)-6-hydroxynaphtho[2,1]thiazole-8-sulfonic acid

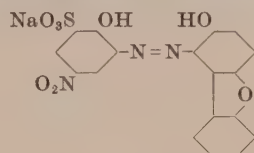
* Developed with 2-naphthol

Discoverer — A. Thauss 1904

Bayer Co., BP 27843/04; USP 794568; FP 355046; GP 166903 (Fr. 8, 695)

FIAT 764 — Diazogeranin B ex.

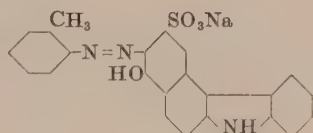
Soluble in water (scarlet) and ethanol (brownish orange)

H₂SO₄ conc. — magenta; on dilution — palerAqueous solution + HCl conc. — magenta ppt;
+ NaOH conc. — orange brown ppt.**19600 C.I. Mordant Brown 21 (Reddish brown)**

6-Amino-4-nitro-1-phenol-2-sulfonic acid → 2-Dibenzofuranol

Discoverer — I.G.

BIOS MISC. 20, Appendix 25 (Acid Alizarine Brown TBL)
Gilman & von Ess, JACS, 61 (1939), 3146

19610 Acid Dye*o*-Toluidine → 4-Hydroxy-7*H*-benzo[*c*]carbazole-2-sulfonic acid

Discoverer — H. Bucherer 1909

Naphthamine Fast Bordeaux BR (K)

Dyes wool from an acid or neutral bath

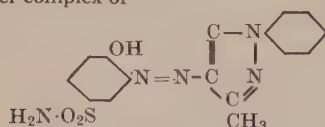
Kalle Co., BP 8127/10; USP 1024308; FP 414523; GP 228959 (Fr. 10, 905)

Joyce, Ind. Eng. Chem. 13 (1921), 948

Soluble in water (magenta red)

H₂SO₄ conc. — blue; on dilution — reddish brown ppt.Aqueous solution + HCl — reddish brown gelatinous ppt;
+ NaOH — violet ppt.**ADDENDUM****18732 C.I. Acid Orange 60**

1:2 Copper complex of



2-Amino-1-phenol-4-sulfonamide → 3-methyl-1-phenyl-5-pyrazolone

DISAZO DYES — I

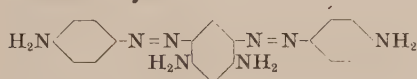
DYES OF GENERAL FORMULA: $A \rightarrow Z \leftarrow A$

There is only a small number of mononuclear intermediates which perform efficiently as twice coupling components (Z) and this is consequently a relatively small sub-group of the disazo dyes. The water insoluble dyes are first dealt with followed by the water soluble dyes almost all of which are Acid or Mordant dyes, the hue range lying chiefly among dull blues, greens, browns and blacks.

The dyes are arranged in a succession based primarily on the twice coupling component which commonly has the major influence in determining the general properties of the dyes. The dyes fall into the following groups —

| C.I. Numbers | Nature of "Z" Component | Application Classes | Number of Dyes Contained |
|--------------|---|--|--------------------------|
| 20000–20045 | Dyes without $-\text{COOH}$, $-\text{SO}_3\text{H}$ or $-\text{SO}_2\text{NH}_2$ salt forming groups | Various | 8 |
| 20070–20140 | <i>m</i> -Arylenediamines | Acid, Mordant (Brown) | 13 |
| 20150–20305 | Phenol, Resorcinol and 1-Naphthol | Acid, Mordant, Leather (Orange and Brown) | 24 |
| 20320–20540 | Aminonaphtholsulfonic acid | Acid (Blue, Green, Black), Mordant (Dark green, Black) | 34 |
| | | TOTAL | 79 |

20000 Leather Dye



(1) *p*-Aminoacetanilide (2 mol.) \Rightarrow *m*-Phenylenediamine;
then hydrolyse the acetamido groups or

(2) *p*-Nitroaniline (2 mol.) \Rightarrow *m*-Phenylenediamine;
then reduce the nitro groups with sodium sulfide

The commercial dye is sold as the hydrochloride

Discoverers — C. Rudolph and G. Palm 1890

Leather Brown (GrE)

Oehler, *BP* 11218/91; *USP* 462414; *GP* 57429 (*Fr.* 3, 737)
Coupling of *m*-phenylenediamine with 2 mol. diazo compound:
Schmidt & Hagenböcker, *Ber.* 54 (1921), 2201
Bucherer & Mohlau, *J. prakt. Chem.* 131 (1931), 200, 236

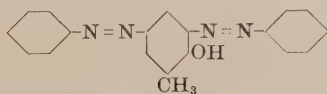
Soluble in water (brown)

H_2SO_4 conc. — brown; on dilution — yellowish brown ppt.

Aqueous solution + HCl — yellower, ppt;

+ NaOH conc. — brown ppt. of the colour base

20010 C.I. Solvent Yellow 28



Aniline (2 mol.) \Rightarrow *o*-Cresol

Soluble in ethanol and toluene

Very slightly soluble in water

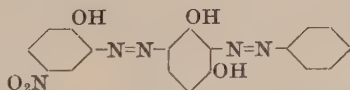
H_2SO_4 conc. — reddish brown; on dilution — dull brown solution then yellowish brown ppt.

HCl conc. (warm) — yellowish brown solution

NaOH 2% (warm) — reddish brown solution

20018 C.I. Acid Brown 233 (Reddish brown)

A 2:1 chromium complex of



Aniline \rightarrow [2:1 Chromium complex prepared from
2-Amino-4-nitrophenol \rightarrow Resorcinol]

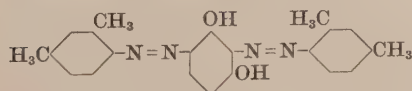
Soluble in water (brown) and in ethanol (reddish brown)

H_2SO_4 conc. — orange brown; on dilution — orange brown

Aqueous solution + HCl — reddish brown precipitate;

+ NaOH — red

20020 C.I. Solvent Orange 30 (Bright orange)



2,4-Xylydine (2 mol.) \Rightarrow Resorcinol

Coupling of resorcinol with 2 mol. diazo compound:

Liebermann & von Kostanecki, *Ber.* 17 (1884), 880

von Kostanecki, *Ber.* 20 (1887), 3137; 21 (1888), 3117

Orndorf & Ray, *Amer. Chem. J.* 44 (1910), 1

Baker, *JCS*, (1934), 1684

For other references to the coupling of resorcinol see
C.I.11920

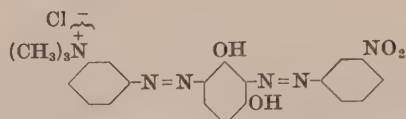
Soluble in ethanol and toluene

H_2SO_4 conc. — crimson; on dilution — reddish brown solution,
then red brown ppt.

NaOH 2% (warm) — orange brown solution

20025

Basic Dye



(*m*-Aminophenyl)trimethylammonium chloride
 $\xrightarrow{\text{Resorcinol}}$
 $\xrightarrow{\text{m-Nitroaniline}}$

M.L.B., GP 95530 (Fr. 5, 542)

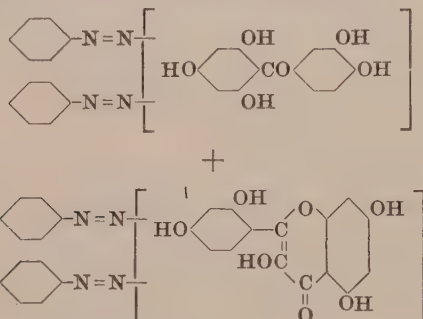
Of the three dyes named in C.I.236, 1st Edition as having this constitution, two are shown in BIOS reports with quite different constitutions (see Janus Yellow G, C.I.26060 and Janus Yellow R, C.I.26140)

It seems doubtful whether there has ever been a commercial dye of this constitution

20030

Mordant Dye

Mixture of dyes corresponding approximately to



Aniline (2 mol.)
 \Rightarrow Fustic extract (Maclurin and Morin, C.I.75240 and 75660)

Discoverer — C. S. Bedford 1887

Patent Fustin GO (YDC)

Dyes chromé-mordanted wool or wool in the presence of acid, moderately fast to light and milling

Patent Fustin (YDC)

This was a closely similar dye made from maclurin alone
 BP 12667/87; USP 409384; FP 190164; GP 47274 (Fr. 2, 494)
 Thompson & Claus, BP 14836/88
 Herzfeld, *Färberztg.* 1 (1890), 104, 338
 Bedford & Perkin, *JCS*, 67 (1895), 933; 71 (1897), 186
 Everest, *JSDC*, 36 (1920), 49

Only slightly soluble in water

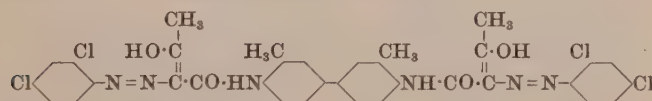
Soluble in ethanol (yellowish brown)

H₂SO₄ conc. — yellowish brown; on dilution — brownish yellow ppt.

NaOH — yellowish brown solution

20040

C.I. Pigment Yellow 16 (Greenish yellow)



2,4-Dichloroaniline (2 mol.) \Rightarrow 4,4'-Bi-o-acetoacetotoluidide

Discoverers — A. Laska and A. Zitscher 1921

Griesheim-Elektron, BP 210217; GP 386054 (Fr. 14, 1006)

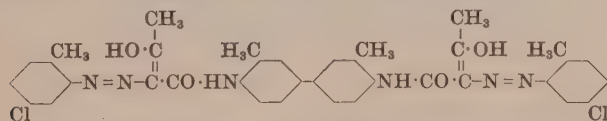
BIOS 1661, 144

FIAT 764 — Permanentgelb NGG (error for NCG)

FIAT 1313, 3, 473

20045

C.I. Pigment Yellow 77 (Bright yellow)

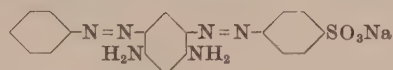


5-Chloro-*o*-toluidine (2 mol.) \Rightarrow 4,4'-Bi-o-acetoacetotoluidide

FIAT 1313, 3, 213

20070

Acid Dye



Aniline $\xrightarrow{\text{Sulfanilic acid}}$ *m*-Phenylenediamine
 (Couplings can be done in either order)

Acid Brown G (A)

Dyes wool from an acid bath

Agfa, GP 22714 (Fr. 1, 453)

Schmidt & Hagenböcker, *Ber.* 54 (1921), 2201 (Coupling positions in *m*-phenylenediamine)

The disazo coupling of *m*-phenylenediamine is shown for convenience as occurring in the 4,6 positions. In most cases the products are probably mixtures of isomers in which the 4,6-coupled dye predominates

Soluble in water (brown)

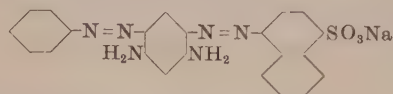
H₂SO₄ conc. — reddish brown; on dilution — yellowish brown

Aqueous solution + HCl — unchanged;

+ NaOH — unchanged

20075

Acid Dye



Aniline (1) $\xrightarrow{\text{Naphthionic acid (2)}}$ *m*-Phenylenediamine

Discoverer — W. Wolff 1882

Acid Brown R (A)

Dyes wool in the presence of acid

Agfa, GP 22714 (Fr. 1, 453)

Soluble in water (brown)

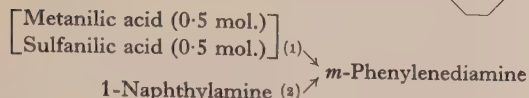
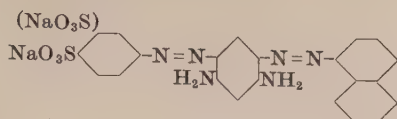
H₂SO₄ conc. — dull olive green; on dilution — reddish solution, then brown ppt.

Aqueous solution + HCl — brown ppt;

+ NaOH — unaltered

20080

C.I. Direct Brown 208



In **Benzo Brown GG** diazotised 1-naphthylamine and sodium carbonate solutions are run side by side into coupling (1) which has been brought into solution with sodium carbonate

Discoverer — M. Herzberg (Bayer Co.) 1887

Agfa, GP 22714 (*Fr.* 1, 453)

FIAT 764 — Benzobraun GG

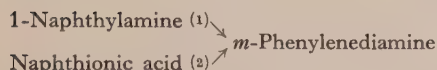
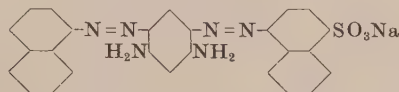
Moderately soluble in water (olive yellow brown)

Soluble in ethanol (yellow orange brown)

 H_2SO_4 conc. — violet brown to black; on dilution — golden yellowAqueous solution + HCl conc. — dark brown ppt;
+ NaOH conc. — yellowish orange brown, ppt.

20090

C.I. Direct Brown 37 (Reddish brown)



In **Cotton Brown N (IG)** the first coupling is effected in acid solution by mixing diazotised 1-naphthylamine and an aqueous solution of *m*-phenylenediamine. For the second coupling diazotised naphthionic acid is added to the total coupling (1) and then a mixed solution of sodium carbonate and caustic soda is slowly added giving finally a weakly alkaline reaction

Agfa, GP 22714 (*Fr.* 1, 453)

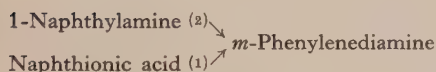
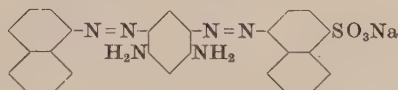
FIAT 764 — Baumwollbraun N

Moderately soluble in water (yellowish brown) and ethanol

 H_2SO_4 conc. — dark blue black; on dilution — brownAqueous solution + HCl conc. — yellowish olive ppt;
+ NaOH conc. — orange brown ppt.

20091

C.I. Direct Brown 50 (Brown)



In **Benzo Brown BR (IG)** diazotised 1-naphthylamine and a solution of sodium carbonate are run side by side into coupling (1) which has been brought into solution with potassium carbonate

The ratio of the isomeric dyes normally formed in disazo couplings with *m*-phenylenediamine is probably different in this case from that of C.I.20090

Discoverer — M. Herzberg (Bayer Co.) 1887

Agfa, GP 22714 (*Fr.* 1, 453)

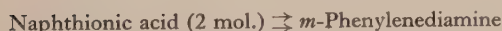
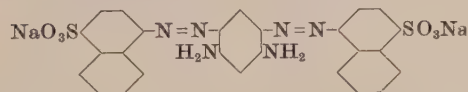
FIAT 764 — Benzobraun BR

Moderately soluble in water (yellowish brown) and ethanol (orange brown)

 H_2SO_4 conc. — bluish black; on dilution — orange brownAqueous solution + HCl conc. — yellowish brown ppt;
+ NaOH conc. — orange brown ppt.

20095

C.I. Acid Brown 5 (Reddish brown)



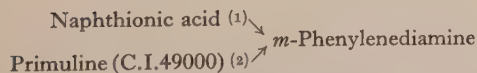
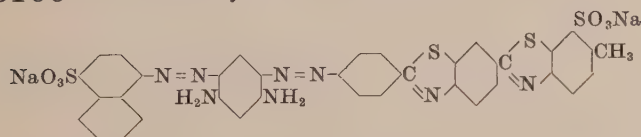
Soluble in water (reddish brown)

Slightly soluble in ethanol (pale orange brown)

 H_2SO_4 conc. — violetAqueous solution + HCl dil. — brown ppt;
+ NaOH conc. — reddish brown ppt.

20100

Direct Dye



Discoverer — J. Walter 1890

Terra-cotta F (Gy)Geigy, BP 1688/90; USP 440288; FP 203439; GP ap. G5870 (*Fr.* 2, 298)

Hall, BP 8215/90

Soluble in water (brown)

 H_2SO_4 conc. — reddish violet; on dilution — brown ppt.Aqueous solution + HCl — brown ppt;
+ NaOH — soluble brown ppt.

20110

C.I. Mordant Brown 1 (Dull reddish brown)

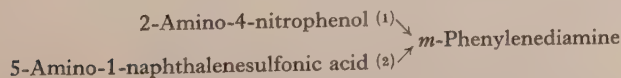
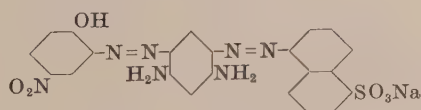
Discoverer — Cassella Co. 1907

BIOS 1548, 93, 94

FIAT 764 — Metachrombraun BC, EB

20111

C.I. Acid Brown 17

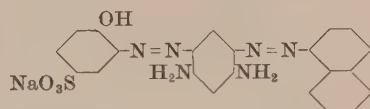


Soluble in water (yellowish brown) and ethanol (orange brown)

Slightly soluble in acetone and Cellosolve

 H_2SO_4 conc. — violet black to bluish black; on dilution — brown (ppt) HNO_3 conc. — reddish brown, becoming yellowerAqueous solution + HCl conc. — brown;
+ NaOH conc. — orange brown

C.I.20111 is recovered from the mother liquor of C.I.20110

20115 Mordant Dye (Dull red)

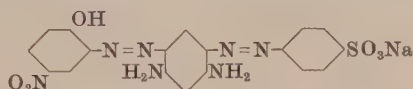
2-Amino-1-phenol-4-sulfonic acid (1) ↘
 1-Naphthylamine (2) ↗ *m*-Phenylenediamine

Metachrome Brown VG conc. (By)

Gives afterchrome and metachrome dyeings of very good fastness to light and good fastness to most other agencies. On a chrome acetate mordant gives prints on wool of good-very good fastness to washing

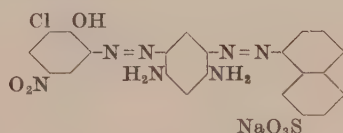
Kalle, *GP* 135017 (*Fr.* 6, 928)

Soluble in water and ethanol (orange brown)
 H_2SO_4 conc. — greyish black; on dilution — brown
 Aqueous solution + HCl conc. — brown;
 + NaOH conc. — orange brown

20120 C.I. Mordant Brown 69 (Dull reddish brown)

2-Amino-4-nitrophenol ↘
 Sulfanilic acid ↗ *m*-Phenylenediamine

Soluble in water (yellowish brown)
 H_2SO_4 conc. — yellowish brown; on dilution — yellowish brown ppt.
 Aqueous solution + HCl — yellowish brown ppt;
 + NaOH conc. — yellowish brown solution

20125 Mordant Dye

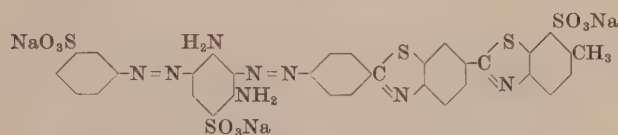
2-Amino-6-chloro-4-nitrophenol (1) ↘
 1,7-Cleve's acid (2) ↗ *m*-Phenylenediamine

Discoverer — H. Jordan 1912

Monochrome Brown BX (By)

Its dyeing properties closely resemble those of Mordant Brown 1

Soluble in water (yellowish brown) and ethanol (orange brown)
 H_2SO_4 conc. — olive brown; on dilution — olive yellow brown
 Aqueous solution + HCl conc. — brown;
 + NaOH conc. — orange brown

20130 C.I. Direct Orange 24 (Dull orange)

Metanilic acid (1) ↘
 Primuline (C.I.49000) (2) ↗ 2,4-Diaminobenzenesulfonic acid

Discoverer — C. L. Müller 1893

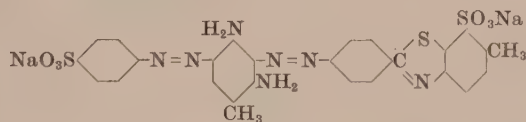
For similar dyes see —

Badische Co., *BP* 21753/93; *USP* 524261; *FP* 231694; *GP* 76118 (*Fr.* 4, 838)

FIAT 764 — Baumwollorange R

C.I. 233 (1st Ed.) — corrected

Soluble in water (brownish orange)
 Very slightly soluble in ethanol (pale golden yellow)
 H_2SO_4 conc. — magenta red (+ some yellow) becoming orange red brown; on dilution — brownish orange
 Aqueous solution + HCl conc. — orange brown;
 + NaOH conc. — golden orange

20140 Direct Dye

Sulfanilic acid (1) ↘
 Dehydrothio-*p*-toluidinesulfonic acid (2) ↗ Toluene-2,4-diamine

Discoverer — Bayer Co. 1887

Cotton Brown RN (By)

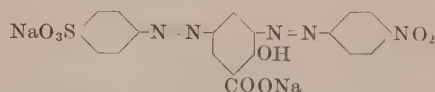
Fastness Properties (C): Acid (organic) 5, Alkali 4,
 Light 1, 1, 2, Washing 1, Water 1

Dischargeability: neutral and alkaline, poor (yellow)

FIAT 764 — Baumwollbraun RN

Schmidt & Hagenböcker, *Ber.* 54 (1921), 2203 (Coupling of toluene-2,4-diamine with 2 mol. diazo compound)

Moderately soluble in water (yellowish brown)
 Soluble in ethanol (yellowish orange brown)
 H_2SO_4 conc. — orange red brown (+ blue and violet); on dilution — yellowish brown
 Aqueous solution + HCl conc. — orange brown ppt;
 + NaOH conc. — reddish brown ppt.

20150 C.I. Mordant Brown 18 (Yellowish brown)

Sulfanilic acid (1) ↘

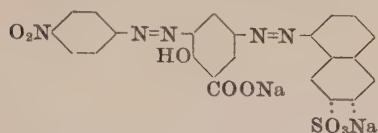
p-Nitroaniline (2) ↗ Salicylic acid

Discoverer — A. Weinberg 1896

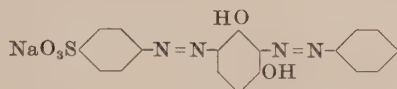
Cassella Co., *BP* 17590/96; *FP* 258783; *GP* 95066 (*Fr.* 5, 518)

Grandmougin & Guisan, *Rev. Gén. Mat. Col.* 12, (1908), 134

Soluble in water (yellowish brown), ethanol and Cellosolve
 Slightly soluble in acetone
 H_2SO_4 conc. — reddish brown; on dilution — cloudy brownish yellow
 HNO_3 conc. — orange solution, turns yellow
 HCl conc. — orange solution
 NaOH 10% — yellowish brown solution
 Aqueous solution + HCl — brown ppt.

20151 C.I. Mordant Brown 90 (Brown)

p-Nitroaniline (2) ↘
1,6(and 1,7)-Cleve's acid (1) ↗ Salicylic acid

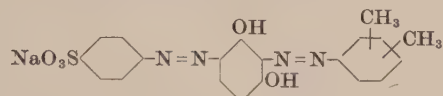
20160 C.I. Acid Orange 25 (Orange → Reddish orange)

Sulfanilic (1) ↘
Aniline (2) ↗ Resorcinol

Coupling of Resorcinol

For references to the coupling properties of resorcinol see C.I.11920 and C.I.20020

For convenience and consistency disazo dyes from resorcinol are shown here as coupled in 2- and 4-positions; many of the dyes are probably mixtures of the 2,4- and 2,6-coupled products

20170 C.I. Acid Orange 24 (Orange → Reddish orange)

Sulfanilic acid (1) ↘
Crude Xylidine (2) ↗ Resorcinol

In Tropaeolin RNP (IG) a mixture of xylidines and toluidines is used

Discoverer — O. Wallach 1881

Agfa, USP 769359; GP 18861 (*Fr.* 1, 453)

BIOS 1543, 75

FIAT 764 — Resorcinbraun, Tropaeolin RNP

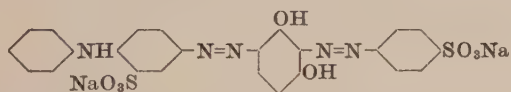
Whitehead, *Chem. Tr. J.* 77 (1925), 92

Soluble in water and ethanol (yellowish brown)

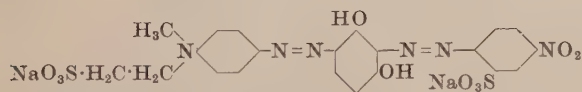
H₂SO₄ conc. — orange brown; on dilution — golden yellow

Aqueous solution + HCl conc. — yellowish brown;

+ NaOH conc. — reddish orange brown

20175 C.I. Acid Brown 213 (Brown)

5-Amino-2-anilinobenzenesulfonic acid (1) ↘
Sulfanilic acid (2) ↗ Resorcinol

20180 Leather Dye

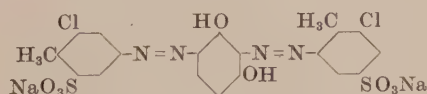
N-*p*-Aminophenyl-*N*-methyltaurine (1) ↘
2-Amino-5-nitrobenzenesulfonic acid (2) ↗ Resorcinol

Igenal Brown IGG (IG)

FIAT 764 — Igenalbraun IGG

20185 Leather Dye

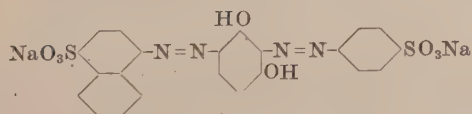
Mixture of monoazo and disazo dyes, the disazo dye probably having the structure



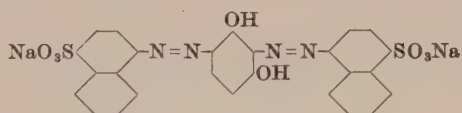
[5-Amino-3-chloro-*o*-toluenesulfonic acid]
[3-Amino-5-chloro-*p*-toluenesulfonic acid] (1.48 mol.) ⇌ Resorcinol

Acid Leather Brown E6G (IG)

FIAT 764 — Saeurelederbraun E6G

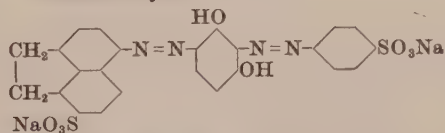
20190 C.I. Acid Brown 15 (Reddish brown)

Naphthionic acid (1) ↘
Sulfanilic acid (2) ↗ Resorcinol

20195 C.I. Acid Brown 14 (Reddish brown)Naphthionic acid (2 mol.) \rightleftharpoons Resorcinol

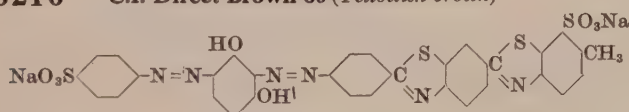
Discoverer — O. Wallach 1881
 Agfa, USP 269359; GP 18861 (Fr. 1, 453)
 FIAT 764 — Echtbraun

Soluble in water (orange brown)
 Slightly soluble in ethanol (yellow brown)
 H₂SO₄ conc. — corinth; on dilution — yellowish brown
 Aqueous solution + HCl conc. — yellowish brown;
 + NaOH conc. — wine red

20200 Leather Dye

6-Amino-3-acenaphthenesulfonic acid (1) \rightleftharpoons Resorcinol
 Sulfanilic acid (2)

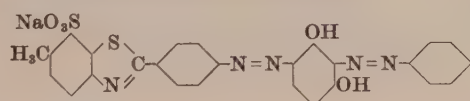
Igenal Brown CG (IG)
 FIAT 764 — Igenalbraun CG

20210 C.I. Direct Brown 80 (Yellowish brown)

Sulfanilic acid (1) \rightleftharpoons Resorcinol
 Primuline (C.I.49000) (2)

Discoverer — Badische Co.
Igenal Brown CRG (IG)
 FIAT 764 — Igenalbraun CRG, Thiazinbraun G

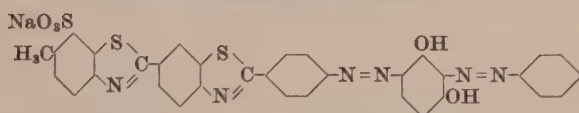
Very soluble in water (orange brown) and ethanol (yellow brown)
 H₂SO₄ conc. — orange brown; on dilution — brownish orange
 Aqueous solution + HCl conc. — orange brown ppt;
 + NaOH conc. — reddish orange brown

20215 C.I. Direct Orange 18 (Orange)

Dehydrothio-*p*-toluidinesulfonic acid (1) \rightleftharpoons Resorcinol
 Aniline (2)

Discoverer — Cassella Co. 1890
 FIAT 764 — Benzobraun 3GC (= 3GG)

Soluble in water (yellowish brown)
 Moderately soluble in ethanol
 H₂SO₄ conc. — orange red to brown (+ some violet); on dilution — orange brown
 Aqueous solution + HCl conc. — orange brown ppt;
 + NaOH conc. — wine red ppt.

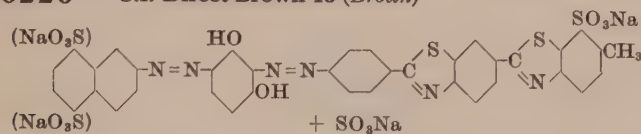
20216 C.I. Direct Orange 18 (Dull orange)

Primuline (C.I.49000) (1) \rightleftharpoons Resorcinol
 Aniline (2)

In some brands Primuline may be replaced by a mixture with dehydrothio-*p*-toluidinesulfonic acid. (Compare C.I.20215)

Discoverer — Cassella Co.
 BIOS 1548, 152
 FIAT 764 — Diaminorange B, Oxaminsaeurebraun G

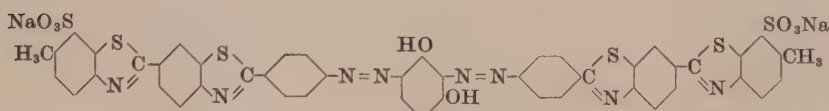
Soluble in water (orange to orange brown)
 Soluble in ethanol (orange brown)
 H₂SO₄ conc. — orange red brown; on dilution — orange
 Aqueous solution + HCl conc. — orange to orange brown ppt;
 + NaOH conc. — magenta to wine red

20220 C.I. Direct Brown 18 (Brown)

6(and 7)-Amino-1-naphthalenesulfonic acid (1) \rightleftharpoons Resorcinol
 Primuline (C.I.49000) (2)

FIAT 764 — Thiazinbraun R

Very soluble in water
 Soluble in ethanol (orange brown)
 H₂SO₄ conc. — orange red brown; on dilution — yellowish brown
 Aqueous solution + HCl conc. — yellowish brown ppt;
 + NaOH conc. — reddish orange brown

20230 C.I. Direct Orange 18 (Orange \rightarrow Dullorange)

Primuline (C.I.49000) (2 mol.) \rightleftharpoons Resorcinol

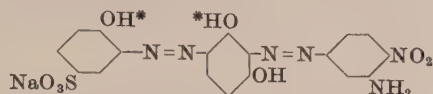
Oxamine Acid Brown G is the product of an unbalanced coupling and contains 33% of C.I.20216

FIAT 764 — Oxaminsaeurebraun G

Reactions of Oxamine Acid Brown G —
 Slightly soluble in water (orange brown)
 Soluble in ethanol (orange brown)
 H₂SO₄ conc. — orange red brown (+ dark blue); on dilution — orange brown
 Aqueous solution + HCl conc. — yellowish orange brown;
 + NaOH conc. — wine red ppt.

20250 C.I. Acid Brown 83 (Yellowish brown)*

A complex copper compound; the copper is probably associated with hydroxy groups marked * in



Convert 4-Methoxymetanic acid → Resorcinol into a copper complex by heating with a solution of copper sulfate in ammonia, and then couple with diazotised 4-nitro-*m*-phenylenediamine

The methoxyl group is replaced by hydroxyl during the copper complex formation

* On leather

Discoverer — E. Fellmer 1933

I.G., BP 447775; USP 2111559; FP 781862; GP 670935 (Fr. 25, 694)

FIAT 764 — Igenalbraun CGG

Soluble in water (yellowish brown)

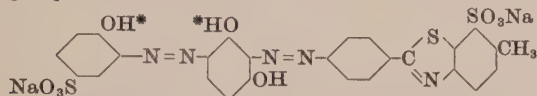
Insoluble in ethanol

H₂SO₄ conc. — reddish orange brown; on dilution — yellowish brown

Aqueous solution + HCl conc. — yellowish brown;
+ NaOH conc. — reddish orange brown

20255 C.I. Acid Brown 84 (Reddish brown)*

A complex copper compound; the copper is probably associated with hydroxy groups marked * in



Convert 4-Chlorometanic acid → Resorcinol into a copper complex by heating with aqueous copper sulfate solution and caustic soda and then couple with diazotised dehydrothio-*p*-toluidinesulfonic acid

The chloro group is replaced by hydroxyl during the coppering process

* On leather

Discoverer — E. Fellmer 1933

I.G., BP 447775; USP 2111559; FP 781862; GP 670935 (Fr. 25, 694)

FIAT 764 — Igenalbraun CM

Soluble in water (yellowish brown)

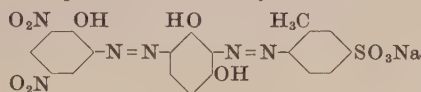
Very slightly soluble in ethanol

H₂SO₄ conc. — reddish orange brown; on dilution — brownish yellow to yellowish brown

Aqueous solution + HCl conc. — yellowish brown;
+ NaOH conc. — reddish orange brown

20260 C.I. Acid Brown 143 (Dull reddish brown)*

A chromium complex of the disazo dye



Picramic acid (1) (acetic acid) → Resorcinol

4-Amino-*m*-toluenesulfonic acid (2) →

then heat with aqueous chromium formate for 2 hr. at 100–102°C to form the chromium complex

* On leather

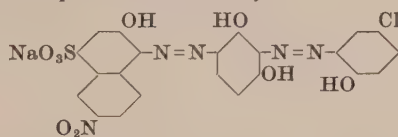
Discoverers — H. Krzikalla and W. Limbacher 1936

I.G., GP ap. I 54967 (Fr.-Bayer, I-1, 855)

FIAT 764 — Erganildunkelbraun CN

20265 C.I. Acid Black 82

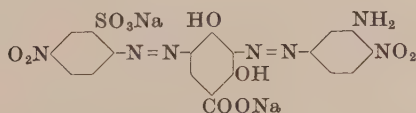
A chromium complex of the disazo dye



1-Amino-6-nitro-2-naphthol-4-sulfonic acid (1) (alk.) → Resorcinol;

2-Amino-4-chlorophenol (2) (alk.) →

then heat with aqueous chromium formate for 4 hr. at 100°C to form the chromium complex

20280 Acid Dye

2-Amino-5-nitrobenzenesulfonic acid (1) (formic acid) → β-Resorcylic acid

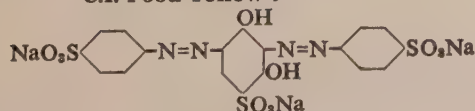
4-Nitro-*m*-phenylenediamine (2) (caustic soda) →

Igenal Brown E3G (IG)

Dye for leather

FIAT 764 — Saeurelederbraun E3G

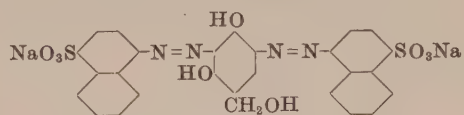
FIAT 1313, 2, 261

**20281 C.I. Acid Yellow 105
C.I. Food Yellow 9**

Sulfanilic acid (2 mol.) → 2,4-Dihydroxybenzene sulfonic acid

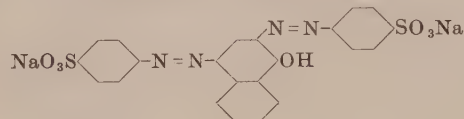
H. Ackroyd BP 373689

Food Standards Committee Report on
Colouring Matters (HMSO 1964) para. 7

20285 C.I. Food Brown 3 (Reddish brown)

Naphthionic acid (2 mol.) \Rightarrow 2,4-Dihydroxybenzyl alcohol

Soluble in water (brown)
 H_2SO_4 conc. — purple; on dilution — purple brown ppt. to chocolate brown ppt. and solution
 Aqueous solution + HCl conc. — dull chocolate brown ppt. and solution;
 + NaOH conc. — magenta solution

20300 C.I. Acid Brown 43 (Yellowish brown)*

Sulfanilic acid (2 mol.) (caustic soda) \Rightarrow 1-Naphthol

Evaporate to dryness to isolate; the dye cannot be salted out

* On leather

Discoverer — Weiler-ter-Meer 1882

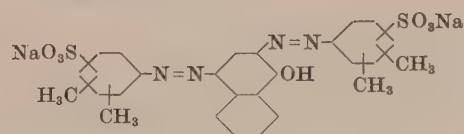
Coupling of 1-naphthol with 2 mol. diazo compound:

Krohn, *Ber.* **21** (1888), 3240

Nölting & Grandmougin, *Bull. Soc. chim.* **5** (1891), 873

Bamberger, *Ber.* **28** (1895), 1894

Soluble in water (reddish brown)
 H_2SO_4 conc. — violet; on dilution — yellowish brown
 Aqueous solution + HCl — violet ppt;
 + NaOH — cherry red

20305 Acid Dye

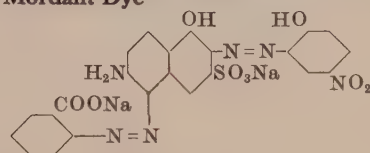
Aminoxylenesulfonic acid (2 mol.) \Rightarrow 1-Naphthol

Discoverer — L. Limpach 1879

Fast Brown ONT (LDC)

Dyes wool and silk in the presence of acid

Soluble in water (brown) and ethanol (ruby red)
 H_2SO_4 conc. — violet; on dilution — red
 Aqueous solution + HCl — violet red ppt;
 + NaOH conc. — reddish yellow

20320 Mordant Dye

Anthranilic acid (acid)⁽¹⁾ \rightarrow J acid

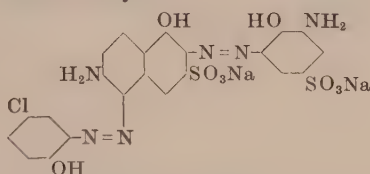
2-Amino-4-nitrophenol (alk.)⁽²⁾ \rightarrow J acid

Discoverer — O. Günther 1913

Diamond Black PG extra (By). An afterchrome dye

Bayer Co., BP 29567/13; USP 1159375; GP 286048 (*Fr.* **12**, 350)

Soluble in water (bordeaux)
 Moderately soluble in ethanol (red)
 H_2SO_4 conc. — bluish black; on dilution — wine red
 Aqueous solution + HCl conc. — reddish orange brown, ppt;
 + NaOH conc. — wine red

20325 Mordant Dye

2-Amino-4-chlorophenol ⁽¹⁾ (acid) \rightarrow J acid;

2-Amino-6-nitro-1-phenol-4-sulfonic acid ⁽²⁾ (alk.) \rightarrow J acid;
 then reduce the nitro group with sodium sulfide

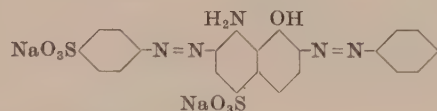
Discoverers — W. Kirst and E. Fischer 1939

Autazol Chrome Black GR (IG)

For blacks on cellulose-wool mixtures. Applied in normal way as a direct dye, diazotised, treated with ammonia and finally afterchromed

I.G., GP 732081 (*Fr.-Bayer*, **I-1**, 1269)

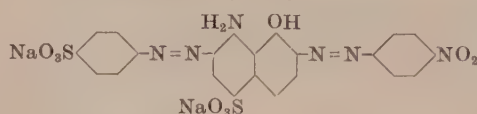
BIOS MISC 20, Appendix No. 65

20340 Acid Dye

Sulfanilic acid ⁽¹⁾ (acid) \rightarrow S acid

Aniline ⁽²⁾ (alk.) \rightarrow S acid

FIAT 764 — Wollschwarz RL ex.

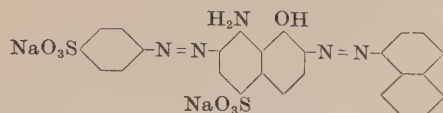
20345 C.I. Acid Black 16 (Black)

Sulfanilic acid ⁽¹⁾ (mineral acid) \rightarrow S acid

p-Nitroaniline ⁽²⁾ (bicarb.) \rightarrow S acid

FIAT 764 — Wollschwarz GR "F"

Soluble in water
 Slightly soluble in ethanol
 Very slightly soluble in acetone
 Insoluble in benzene
 H_2SO_4 conc. — dark green; on dilution — violet

20350 C.I. Acid Black 17 (Reddish black)

Sulfanilic acid (1) (*acid*) → S acid
 1-Naphthylamine (2) (*alk.*) →

Discoverer — C. Bülow 1891

Badische Co., *BP* 7713/91; *USP* 524665, 590088; *FP* 213232; *GP* 71199 (*Fr.* 3, 607), *GP* 91855 (*Fr.* 4, 774)

Bayer Co., *BP* 9894/93; *USP* 593790; *FP* 233609

Agfa, *GP ap.* A3959 (*Fr.* 4, 776)

FIAT 764 — Wollschwarz 6BG

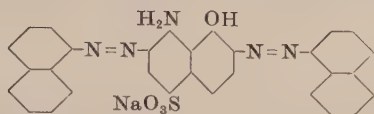
Mayer, *Z. f. Microsc.* 34 (1918), 321

Soluble in water (dark blue)

Slightly soluble in ethanol

H₂SO₄ conc. — blue; on dilution — granular blue ppt.

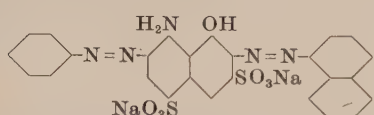
Aqueous solution + HCl — bluish green (dark ppt. with excess);
 + NaOH conc. — blue

20355 Mordant Dye

1-Naphthylamine (1) (*acetic acid*) → S acid
 1-Naphthylamine (2) (*alk.*) →

Chrome Fast Black B (IG)

FIAT 764 — Chromechtschwarz B

20370 Acid Dye

Aniline (1) (*acid*) → K acid
 1-Naphthylamine (2) (*alk.*) →

Discoverers — K. Elbel and J. Rosenberg 1896

Blue Black CDF (K)

Kalle Co., *USP* 613638; *FP* 271070; *GP* 108266 (*Fr.* 5, 505)

FIAT 764 — Blauschwarz CDF

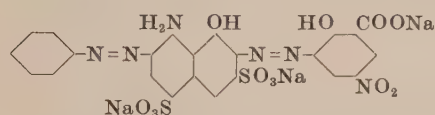
Soluble in water (dark blue)

Slightly soluble in ethanol (blue)

H₂SO₄ conc. — olive grey to black; on dilution — dull blue

Aqueous solution + HCl conc. — bluish green, ppt;

+ NaOH conc. — violet

20375 Mordant Dye

Aniline (1) (*acid*) → K acid
 3-Amino-5-nitrosalicylic acid (2) (*alk.*) →

Discoverer — Griesheim-Elektron 1902

Chrome Dark Green 3B40 (GrE)

Kalle Co., *GP* 150124 (*Fr.* 7, 396)

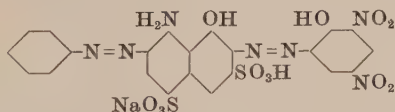
Soluble in water (violet blue)

Slightly soluble in ethanol (blue)

H₂SO₄ conc. — olive green; on dilution — dullish blue

Aqueous solution + HCl conc. — bluish green;

+ NaOH conc. — reddish blue

20380 Mordant Dye

Aniline (1) (*acid*) → K acid
 Picramic acid (2) (*alk.*) →

(The constitution shown in C.I.245 (1st Ed.) has been corrected)

Discoverer — K. Elbel 1898

Chrome Patent Green N (K)

Dyes wool deep green by the afterchrome process. Good fastness to milling but only poor-moderate to other agencies

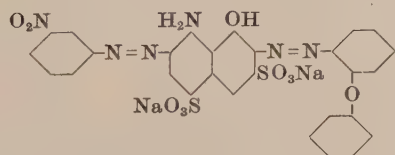
Kalle Co., *BP* 15074/99; *FP* 291316; *GP* 110711 (*Fr.* 5, 528)

Soluble in water (dull blue)

H₂SO₄ conc. — dark green; on dilution — bluish green ppt.

Aqueous solution + HCl conc. — bluish green ppt;

+ NaOH conc. — blue ppt.

20385 Acid Dye

m-Nitroaniline (1) (*acid*) → K acid
o-Phenoxyaniline (2) (*alk.*) →

Discoverers — F. Runkel and M. Herzberg 1908

Sulphon Acid Black R (By)

Bayer Co., *GP* 214496 (*Fr.* 9, 319)

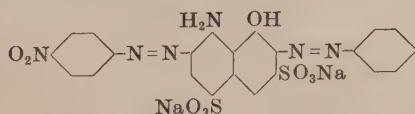
FIAT 764 — Sulfonschwarz R (*error for* Sulfonsaeureschwarz R)

Moderately soluble in water and ethanol (deep violet)

H₂SO₄ conc. — greyish black; on dilution — dullish violet

Aqueous solution + HCl conc. — corinth, ppt;

+ NaOH conc. — deep violet

20390 Acid Dye

p-Nitroaniline (1) (*acid*) → K acid
 Aniline (2) (*alk.*) →

Discoverers — K. Elbel and I. Rosenberg

Blue Black N (K)

Dyes wool in the presence of acid

Kalle Co., *USP* 563384, 613639; *FP* 271070; *GP* 108266 (*Fr.* 5, 505)

Slightly soluble in water and ethanol (dark blue)

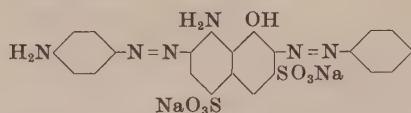
H₂SO₄ conc. — green; on dilution — bright blue

Aqueous solution + HCl conc. — greenish blue;

+ NaOH conc. — blue

20391

Acid Dye



Reduce the nitro group in C.I.20390 with sodium sulfide

In Blue Black NWDF 20% of the K acid is replaced by H acid

Discoverers — K. Elbel and J. Rosenberg (Kalle Co.) 1896

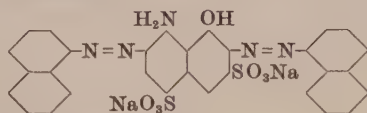
Blue Black NWDF (K)

FIAT 764 — Blauschwarz NWDF

Soluble in water (dark blue) and ethanol (dark bluish green)
 H₂SO₄ conc. — bluish green; on dilution — blue
 Aqueous solution + HCl conc. — deep blue, ppt;
 + NaOH conc. — violet

20395

Acid Dye



1-Naphthylamine (1) (acid) → K acid

1-Naphthylamine (2) (alk.) →

In Wool Black GM part of the K acid is replaced by H acid

Wool Black GM (K)

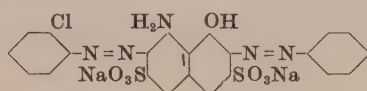
Kalle Co., USP 613638-9; FP 271070; GP 108266 (Fr. 5, 505)

FIAT 764 — Wollschwarz GM

Moderately soluble in water and ethanol (deep blue)
 H₂SO₄ conc. — deep blue; on dilution — dullish blue
 Aqueous solution + HCl conc. — greenish deep blue;
 + NaOH conc. — deep blue

20410

Acid Dye



o-Chloroaniline (1) (acid) → H acid

Aniline (2) (alk.) →

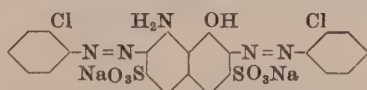
Discoverer — Griesheim-Elektron

Cresol Black 6B (GrE)

Soluble in water and ethanol (dark blue)
 H₂SO₄ conc. — greyish black; on dilution — blue
 Aqueous solution + HCl conc. — blue, ppt;
 + NaOH conc. — violet

20415

C.I. Acid Blue 87 (Navy)



o-Chloroaniline (1) (acid) → H acid

o-Chloroaniline (2) (alk.) →

Slightly soluble in water and acetone

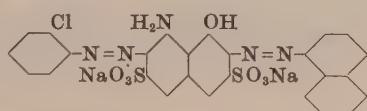
Soluble in ethanol

H₂SO₄ conc. — violet; on dilution — bluish green

NaOH conc. — bluish grey

20420

Acid Dye



o-Chloroaniline (1) (acid) → H acid

1-Naphthylamine (2) (alk.) →

Discoverer — Cassella Co.

Naphthol Blue Black FG (C)

FIAT 764 — Naphtholblauschwarz FG

Soluble in water (blue)

Slightly soluble in ethanol (greenish blue)

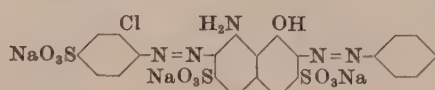
H₂SO₄ conc. — grey; on dilution — weak greenish blue

Aqueous solution + HCl conc. — greenish blue, ppt;

+ NaOH conc. — violet

20425

Acid Dye



3-Chlorosulfanilic acid (1) (acid) → H acid

Aniline (2) (alk.) →

Discoverer — Griesheim-Elektron

Ink Black B85 (GrE)

FIAT 764 — Tintenschwarz B85

Soluble in water (reddish blue)

Soluble in ethanol (reddish blue)

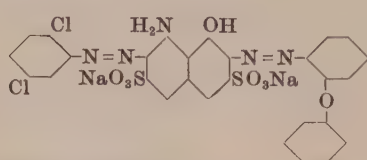
H₂SO₄ conc. — greenish blue (+ violet blue); on dilution — violet

Aqueous solution + HCl conc. — blue;

+ NaOH conc. — violet blue

20430

Acid Dye



2,5-Dichloroaniline (1) (acid) → H acid

o-Phenoxyaniline (2) (alk.) →

Discoverers — F. Runkel and M. Herzberg 1908

Sulphon Acid Green B (By)

Bayer Co., USP 932812-3; GP 214496 (Fr. 9, 319)

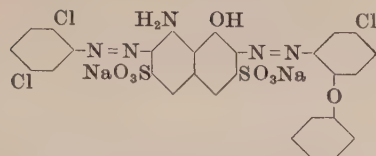
Soluble in water (blue)

Slightly soluble in ethanol (blue)

H₂SO₄ conc. — bluish green; on dilution — blue

Aqueous solution + HCl conc. — greenish blue;

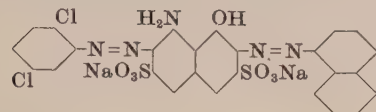
+ NaOH conc. — blue

20435 C.I. Acid Blue 128 (Dull greenish blue)

2,5-Dichloroaniline (1) (acid) \searrow H acid
 5-Chloro-2-phenoxyaniline (2) (alk.) \nearrow

Discoverers — F. Runkel and M. Herzberg 1908
 Bayer Co., GP 216642 (Fr. 9, 322)
 BIOS 1548, 70

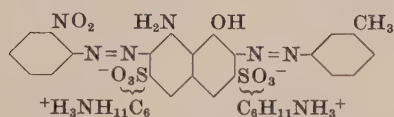
Soluble in water
 Slightly soluble in ethanol (blue)
 H_2SO_4 conc. — dullish bluish green; on dilution — blue
 Aqueous solution + HCl conc. — greenish blue;
 + NaOH conc. — blue

**20440 C.I. Acid Green 19 (Dull bluish green)
C.I. Mordant Green 11 (Dull bluish green)**

2,5-Dichloroaniline (1) (acid) \searrow H acid;
 1-Naphthylamine (2) (alk.) \nearrow

Discoverer — Bayer Co. 1898
 BIOS 1548, 91
 FIAT 764 — Diamantgruen SS

Soluble in water (bluish green)
 Moderately soluble in ethanol
 H_2SO_4 conc. — bluish black; on dilution — blue
 Aqueous solution + HCl conc. — bluish green;
 + NaOH conc. — reddish blue

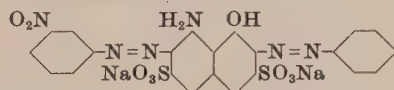
20450 Solvent Dye

o-Nitroaniline (1) (acid) \searrow H acid;
m-Toluidine (2) (alk.) \nearrow

then convert into the biscyclohexylamine salt

Zapon Fast Blue CGG (IG)
 FIAT 1313, 3, 133

Very soluble in water (navy blue) and Cellosolve
 Soluble in ethanol
 H_2SO_4 conc. — bluish green; on dilution — blue ppt.
 Aqueous solution + H_2SO_4 10% — paler blue;
 + NaOH 10% — violet

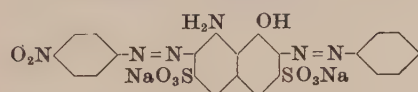
20460 C.I. Acid Blue 29 (Navy)

m-Nitroaniline (1) (acid) \searrow H acid
 Aniline (2) (alk.) \nearrow

Discoverer — M. Hoffmann 1891
 Cassella Co., BP 6972/91; USP 480326; FP 201770; GP 65651 (Fr. 3, 675)
 BP 1742/91; FP 210950; GP 67062 (Fr. 3, 466)
 BIOS 1548, 76
 FIAT 764 — Amidoschwarz 10B, BC
 Whitehead, Chem. Tr. J. 77 (1925), 152
 Appel, Brode & Welch, Ind. Eng. Chem. 18 (1926), 627
 Appel, Ind. Eng. Chem. 18 (1926), 708

Soluble in water (blue black), ethanol (deep blue), and Cellosolve
 Slightly soluble in acetone
 Insoluble in other organic solvents
 H_2SO_4 conc. — bluish green; on dilution — dull greenish blue, ppt.

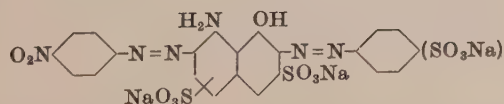
HNO_3 conc. — dull green solution, becomes maroon
 NaOH (10%) — royal blue solution
 Aqueous solution + HCl conc. — greenish blue, ppt;
 + NaOH conc. — blue, ppt.

20470 C.I. Acid Black 1 (Bluish black)

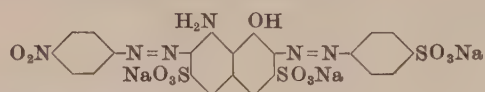
p-Nitroaniline (1) (acid) \searrow H acid
 Aniline (2) (alk.) \nearrow

Discoverer — A. Blank 1902
Acid Black LD (K)
 FIAT 764 — Saeureschwarz LD

Soluble in water (blue) and ethanol (sky blue)
 H_2SO_4 conc. — deep green; on dilution — blue
 Aqueous solution + HCl conc. — blue;
 + NaOH conc. — sky blue

20475 Acid Dye

p-Nitroaniline (1) (acid) \searrow [0.7 mol. H acid]
 [0.3 mol. Aniline] (2) (alk.) \nearrow [0.3 mol. K acid]
 [0.7 mol. Sulfanilic acid]

20480 C.I. Acid Black 41 (Bluish black)

p-Nitroaniline (1) (acid) \searrow
Sulfanilic acid (2) (alk.) \nearrow H acid

NaOH 10% — royal blue solution
Aqueous solution + HCl conc. — dullish deep blue;
+ NaOH conc. — deep blue

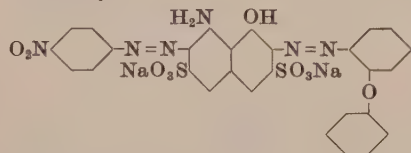
Discoverer — M. Hoffmann 1891

Cassella Co., BP 1742/91, 6972/91; USP 480326; FP 201770;
GP 65651 (Fr. 3, 675)

BIOS 1548, 77

FIAT 764 — Blauschwarz NSF

Soluble in water (deep blue to blue black)
Very soluble in Cellosolve
Slightly soluble in ethanol
Insoluble in other organic solvents
H₂SO₄ conc. — olive green to dark green; on dilution — deep blue, ppt.
HNO₃ conc. — green solution, turning maroon

20485 Acid Dye

p-Nitroaniline (1) (acid) \searrow
o-Phenoxyaniline (2) (alk.) \nearrow H acid

Discoverers — F. Runkel and M. Herzberg 1908

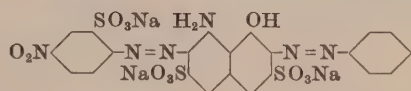
Naphthylamine Black 5GL (IG)

Bayer Co., USP 932812-3; GP 214496, 216642, (Fr. 9, 319, 322)

BIOS 1548, 78

FIAT 764 — Naphtylaminschwarz 5GL

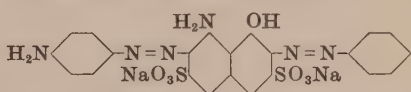
Soluble in water (blue) and ethanol (greenish blue)
H₂SO₄ conc. — dark green; on dilution — bright blue
Aqueous solution + HCl conc. — turquoise blue;
+ NaOH conc. — bright blue

20490 Acid Dye

2-Amino-5-nitrobenzenesulfonic acid (1) (acid) \searrow
Aniline (2) (alk.) \nearrow H acid

Ink Black M (ICS)

Soluble in water (bluish green)
H₂SO₄ conc. — greenish blue; on dilution — bluish green
Aqueous solution + HCl conc. — unaltered;
+ NaOH dil. — unaltered

20495 C.I. Acid Green 20 (Dull bluish green → Greenish black)

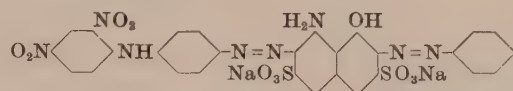
Reduce the nitro group in C.I.20470 with sodium sulfide

Discoverer — Geigy Co. 1909

BIOS 1548, 69

FIAT 764 — Amidoschwarzgruen B

Soluble in water (dull bluish green) and Cellosolve
Slightly soluble in ethanol
Insoluble in other organic solvents
NaOH 10% — violet solution
H₂SO₄ conc. — bluish green; on dilution — blue (ppt.)
HNO₃ conc. — brown solution
Aqueous solution + HCl conc. — blue ppt;
+ NaOH conc. — violet

20496 Acid Dye

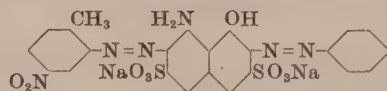
Condense C.I.20495 with 1-Chloro-2,4-dinitrobenzene

Discoverers — R. Kirchhoff, R. Haugwitz and M. Cantor 1925

Silk Black Green BS (IG)

I.G., FP 615267; GP 439518 (Fr. 15, 522)

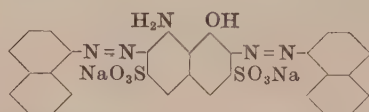
FIAT 764 — Seidenschwarzgruen BS

20500 C.I. Acid Black 28 (Bluish black)

5-Nitro-*o*-toluidine (1) (acid) \searrow
Aniline (2) (alk.) \nearrow H acid

Cassella Co., BP 15725/91; FP 201770; GP 70393 (Fr. 3, 603)

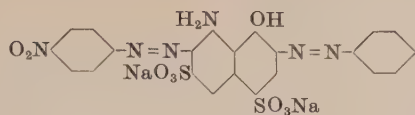
Soluble in water
Slightly soluble in ethanol
Very slightly soluble in acetone
Insoluble in benzene
H₂SO₄ conc. — green; on dilution — bluish green

20510 Acid Dye

1-Naphthylamine (acid) (1) \searrow
1-Naphthylamine (alk.) (2) \nearrow H acid

FIAT 764 — Wollschwarz GM

Wool Black GM is a mixed dye and consists of C.I.20395 and C.I.20510 (see C.I.20395)

20520 Acid Dye

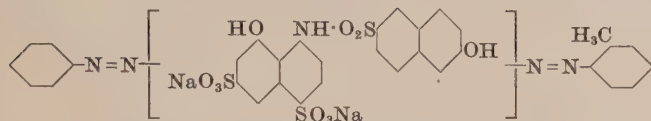
p-Nitroaniline (1) (*acid*)
 Aniline (2) (*alk.*)
 \rightarrow 8-Amino-1-naphthol-4,6-disulfonic acid

Domingo Blue Black B (L)

Dyes wool in the presence of acid and silk from the boiled-off liquor. Discharged by zinc dust or stannous chloride

Leonhardt Co., *BP* 19253/95; *USP* 606438; *GP ap.* F8626 (*Fr.* 4, 567, 764)

Soluble in water (dull violet)
 H_2SO_4 conc. — dull green; on dilution — blue solution, then violet ppt.
 Aqueous solution + HCl — blue

20530 C.I. Acid Red 158 (Red)

(Mixture of Aniline and *o*-Toluidine) (2 mol.)
 \rightarrow 8-(6-Hydroxy-2-naphthylsulfonamido)-1-naphthol-3,5-disulfonic acid

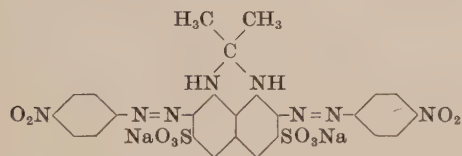
Discoverers — W. Neelmeier and A. Siegwart 1913

Bayer Co., *FP* 469457; *GP* 274082 (*Fr.* 12, 325)

BIOS 1548, 85

FIAT 764 — Saeureanthracenrot 3BL

Soluble in water (orange red)
 Slightly soluble in ethanol (orange red)
 H_2SO_4 conc. — cherry red; on dilution — orange red
 Aqueous solution + HCl conc. — orange red;
 + NaOH conc. — orange brown

20540 Acid Dye

p-Nitroaniline (2 mol.)
 \rightarrow 2,3-Dihydro-2,2-dimethyl-5,8-perimidinedisulfonic acid

Discoverers — C. Schraube and H. Bucherer 1900

Acetone Acid Blue

Badische Co., *BP* 12819/00; *USP* 700563; *FP* 302877;
GP 121228, 122475 (*Fr.* 6, 862, 219)

FIAT 764 — Acetonsaeureblau

NOTES

NOTES


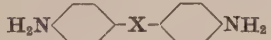

DISAZO DYES — II

DYES OF GENERAL FORMULA: $D \begin{smallmatrix} \swarrow E \\ \searrow E' \end{smallmatrix}$

This is a very large group and includes members of major commercial importance both among the water-insoluble dyes which are dealt with first and the water-soluble dyes which follow. The water-insoluble dyes are chiefly pigments with their main applications in rubber and plastics. The water-soluble dyes are Acid or Direct dyes. The Acid dyes generally belong to the classes possessing high wet fastness in the hue range greenish yellow to bluish red. The Direct dyes cover a wide hue range which, however, includes only few greens, browns and blacks. They include some metal complex dyes, almost all copper complexes, which have high fastness to light.

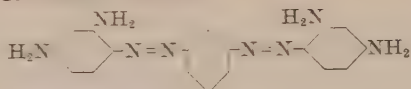
The succession is based primarily upon the tetrazotisable diamine (D) and dyes derived from a common diamine will thus be found together. It is the tetrazo component that usually determines whether the dye belongs to the Acid or to the Direct class.

The dyes fall into the following groups —

| <i>C.I. Numbers</i> | <i>Nature of "D" Component</i> | <i>Typical Application Classes</i> | <i>Number of Dyes Contained</i> |
|--|--|---|---------------------------------|
| Dyes without —COOH, —SO₃H or —SO₂NH₂ salt-forming groups | | | |
| 21000–21030 | <i>m</i> -Arylenediamine | Basic, Solvent | 4 |
| 21050–21220 | Benzidine and derivatives | Pigment | 22 |
| 21230–21280 | Diamines  | Solvent | 6 |
| Water-soluble dyes carrying —COOH, —SO₃H or —SO₂NH₂ groups | | | |
| 21500–21725 | Arylenediamines | Direct Small number of Acid and Mordant | 29 |
| 22000–22640 | Benzidine | Direct (Yellow, Orange, Red, Blue and Black). In 7 examples of Acid or Mordant at least one coupling component is phenol or a derivative | 106 |
| 22750–23130 | Carboxy-, sulfo-, chloro-, and nitro-derivatives of benzidine | Acid or Mordant (usually red) when 2- or 2,2'-substituted. Direct when 3,3'-substituted; copper complex systems in substance or on the fibre from the dicarboxylic acid | 39 |
| 23150–23165 | 3,3'-Dihydroxybenzidine | Direct dyes forming copper complex systems in substance or on the fibre | 4 |
| 23250–23310 | <i>m</i> -Tolidine | Acid (Yellow, Orange, Red) | 12 |
| 23350–23910 | <i>o</i> -Tolidine | Direct (Yellow, Orange, Red, Blue and Black). Acid from 6,6'-disulfo- <i>o</i> -tolidine (2 dyes) | 68 |
| 24000–24500 | <i>o</i> -Dianisidine (and 3-Ethoxybenzidine) | Direct (Blue). Acid from the 6,6'-disulfo-derivative (1 dye) | 71 |
| 24550–24565 | (4,4'-Diamino-3,3'-biphenylylenedioxy)-diacetic acid Bi-nuclear diamines  | Direct (after coppering) | 4 |
| 24750–24840 | X is CH ₂ , CHR or CRR | Acid (Yellow, Orange, Red) | 13 |
| 24850–24920 | X is CH ₂ —H ₂ C or CH = HC | Direct (Yellow, Orange, Red) | 12 |
| 25000–25040 | X is N = N ↓ O | Direct | 7 |
| 25050–25070 | X is NH | Leather and Direct (Blue and Black) | 4 |
| 25080–25135 | X is O or S | Acid and Mordant (Yellow, Orange, Red) | 8 |
| 25200–25450 | X is CO·HN or NH·CO·HN or NH·CS·HN | Direct (Yellow, Orange, Red, Violet) | 34 |
| 25700–25735 |  X is NH or SO ₂ | Direct (Acid from the disulfonic acid) | 4 |
| TOTAL | | | 447 |

21000 C.I. Basic Brown 1

21000:1 C.I. Solvent Brown 41



Treat *m*-phenylenediamine hydrochloride (3 mol.) with nitrous acid (2 mol.)

(The product is a mixture of which the above disazo dye is probably the major component and the commercial dye usually consists of the dihydrochlorides)

Aqueous solution + HCl — unaltered;
+ NaOH 10% — orange ppt.

C.I.21000:1 — The base, is soluble in ethanol, acetone and benzene

Discoverer — C. Martius 1863

Dale & Caro, *BP* 3307/63

FIAT 764 — Vesuvius 3R superfein neu

Caro & Griess, *Z. f. Chem.* **3** (1867), 278

Hartley, *JCS*, **51** (1887), 180 (Spectrum)

Vaubel, *Chemikerztg.* **18** (1894), 1501

Täuber & Walder, *Ber.* **30** (1897), 2111, 2899; **33** (1900), 2897

Möhlau & Meyer, *Ber.* **30** (1897), 2203

Eierman, *Ber.* **31** (1898), 188

Fierz-David & Blangey, 282

Very soluble in water (yellowish brown)

Slightly soluble in ethanol and Cellosolve

Insoluble in acetone, benzene, carbon tetrachloride and Stoddard solvent

H₂SO₄ conc. — brown; on dilution — reddish brown

HNO₃ conc. — orange solution, turns yellow

Discoverer — P. Griess

FIAT 764 — Vesuvius BL neu

Griess, *Ber.* **11** (1878), 627

Fierz-David & Blangey, 282

C.I.21010 —

Very soluble in water (yellowish brown)

Soluble in ethanol and Cellosolve

Slightly soluble in acetone

Insoluble in benzene

H₂SO₄ conc. — brown; on dilution — reddish brown

HNO₃ conc. — violet solution, turns brown

HCl conc. — violet solution (incomplete)

Aqueous solution + HCl conc. — yellowish brown;

+ NaOH 10% — orange

C.I.21010:1 —

M.p. 130°–135°C

Soluble in ethanol and acetone

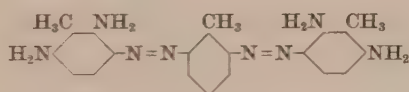
Very slightly soluble in water

Vesuvius BP (B)

A mixed dye containing C.I.21020 as one component and made from a mixture of toluenediamines

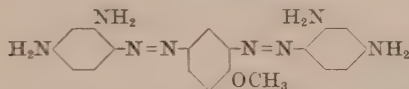
FIAT 764 — Vesuvius BP

21020 Basic Dye



Treat toluene-2,6-diamine hydrochloride (3 mol.) with nitrous acid (2 mol.)

21030 C.I. Basic Brown 2 (Dull reddish brown)*



4-Methoxy-*m*-phenylenediamine \rightleftharpoons *m*-Phenylenediamine (2 mol.)

* On vegetable tanned leather

Discoverer — Agfa

Fierz-David (1926), 133 — Phoenix Brown

Very soluble in water and ethanol

Insoluble in acetone, benzene, and carbon tetrachloride and Stoddard solvent

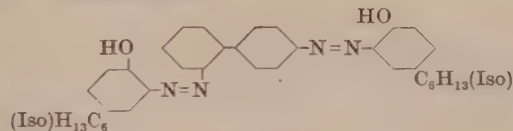
H₂SO₄ conc. — dark brown; on dilution — orange brown solution

HCl conc. — bluish red solution

HNO₃ conc. — brown solution, turns orange;

+ NaOH 10% — no change

21050 Solvent Dye



2,4'-Biphenyldiamine \rightleftharpoons *p*-Isohexylphenol (2 mol.)

Sudan Yellow GRX (IG)

FIAT 764 — Sudangelb GRX

21060 Direct Dye



Benzidine \rightleftharpoons Resorcinol (2 mol.)

Discoverer — P. Friedländer 1886

Pyramidol Brown (LDC); BG (FA)

May be coupled with diazotised *p*-nitroaniline

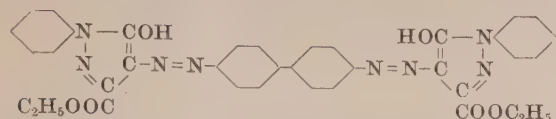
Oehler, *USP* 361404

Soluble in water (orange brown) and ethanol (orange)

H₂SO₄ conc. — reddish violet; on dilution — brown ppt.

Aqueous solution + HCl — brown ppt;

+ NaOH — bordeaux red

21080 C.I. Pigment Red 39 (Bluish red)

Benzidine \Rightarrow 3-Carbethoxy-1-phenyl-5-pyrazolone (2 mol.)

Very slightly soluble in ethanol
Insoluble in water

21090 C.I. Pigment Yellow 12 (Yellow)

3,3'-Dichlorobenzidine \Rightarrow Acetoacetanilide (2 mol.)

Griesheim-Elektron, GP 251479 (*Fr.* 11, 455)

Insoluble in water
Slightly soluble in ethanol
 H_2SO_4 conc. — reddish orange; on dilution — brownish yellow
ppt.
 HNO_3 conc. — brownish yellow

21091 C.I. Pigment Yellow 63 See page 4224**21095 C.I. Pigment Yellow 14 (Yellow)**

3,3'-Dichlorobenzidine \Rightarrow *o*-Acetoacetotoluidide (2 mol.)

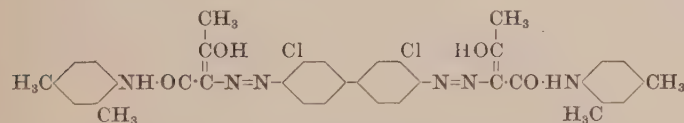
Griesheim-Elektron, GP 251479 (*Fr.* 11, 455)
BIOS 1661, 162
FIAT 764 — Vulcanechtgelb G

Insoluble in water
Very slightly soluble in toluene
 H_2SO_4 conc. — bright reddish orange; on dilution — dirty
greenish yellow ppt.

21096 C.I. Pigment Yellow 55 (Reddish yellow)

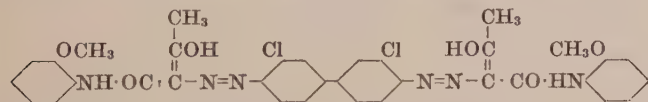
3,3'-Dichlorobenzidine \Rightarrow *p*-Acetoacetotoluidide (2 mol.)

Griesheim-Elektron, GP 251479 (*Fr.* 11, 455)

21100 C.I. Pigment Yellow 13 (Yellow)

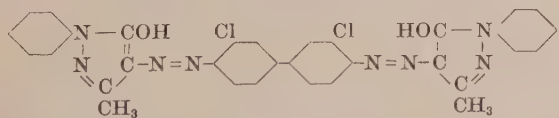
3,3'-Dichlorobenzidine \Rightarrow 2,4-Acetoacetoxylidide (2 mol.)

Griesheim-Elektron, GP 251479 (*Fr.* 11, 455)
BIOS 1661, 164
FIAT 764 — Vulcanechtgelb GR
FIAT 1313, 2, 280, 285

21105 C.I. Pigment Yellow 17 (Bright greenish yellow)

3,3'-Dichlorobenzidine \Rightarrow *o*-Acetoacetanisidide (2 mol.)

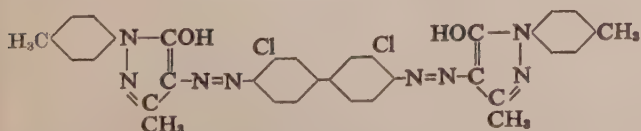
Griesheim-Elektron, GP 251479 (*Fr.* 11, 455)

21110 C.I. Pigment Orange 13 (Reddish orange)

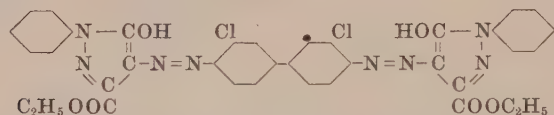
3,3'-Dichlorobenzidine \Rightarrow 3-Methyl-1-phenyl-5-pyrazolone (2 mol.)

Discoverer — A. Laska 1910
Griesheim-Elektron, BP 1730/11; USP 1001286; FP 425429;
GP 236856 (*Fr.* 10, 937)
BIOS 1661, 122
FIAT 764 — Permanentorange G

H_2SO_4 conc. — bluish scarlet; on dilution — reddish orange ppt.
 HNO_3 conc. — brownish scarlet

21115 C.I. Pigment Orange 34 (Orange)

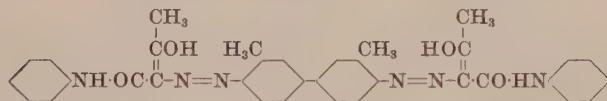
3,3'-Dichlorobenzidine \Rightarrow 3-Methyl-1-*p*-tolyl-5-pyrazolone (2 mol.)

21120 C.I. Pigment Red 38 (Red)

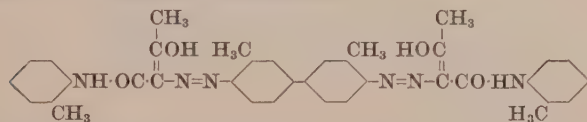
3,3'-Dichlorobenzidine
 \Rightarrow 3-Carboethoxy-1-phenyl-5-pyrazolone (2 mol.)

BIOS 1661, 158
 FIAT 764 — Vulcanechtrot B
 Classical name **Pyrazolone Red**

Very slightly soluble in ethanol
 Insoluble in water

21130 C.I. Pigment Orange 15 (Yellowish orange)

o-Tolidine \Rightarrow Acetoacetanilide (2 mol.)

21135 Pigment (Reddish yellow)*

o-Tolidine \Rightarrow *o*-Acetoacetotoluidide (2 mol.)

* In rubber

Vulcan Fast Yellow R (IG)

Pigment for colouration of rubber. Unaffected by acid or alkali; does not bleed in soap gel

BIOS 1661, 165
 FIAT 764 — Vulcanechtgelb R
 FIAT 1313, 2, 280

21150 Direct Dye

o-Tolidine \Rightarrow Resorcinol (2 mol.)

Discoverer — Pick, Lange & Co. 1898

Pyramidol Brown T (LDC) (FA)

May be coupled with diazotised *p*-nitroaniline

Soluble in water (reddish brown) and ethanol (orange)
 H₂SO₄ conc. — violet; on dilution — blackish brown
 Aqueous solution + HCl — brown ppt;
 + NaOH — brownish red

21160 C.I. Pigment Orange 16 (Bright orange \rightarrow Reddish orange)

o-Dianisidine \Rightarrow Acetoacetanilide (2 mol.)

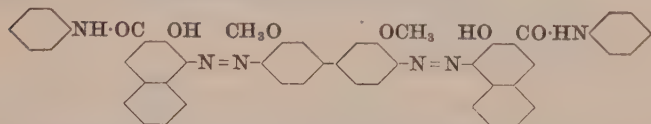
Insoluble in water and ethanol

21165 C.I. Pigment Orange 14 (Yellowish orange)*

o-Dianisidine \Rightarrow 2,4-Acetoacetoxylide (2 mol.)

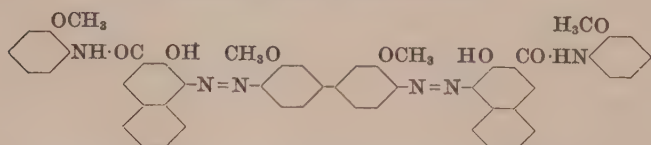
BIOS 1661, 156
 FIAT 764 — Vulcanechtorange GG

* In rubber

21180 C.I. Pigment Blue 25 (Reddish navy)

o-Dianisidine \Rightarrow 3-Hydroxy-2-naphthanilide (2 mol.)

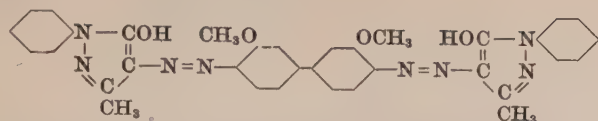
Slightly soluble in ethanol
 Insoluble in water

21185 C.I. Pigment Blue 26 (Reddish navy)

o-Dianisidine \Rightarrow 3-Hydroxy-2-naphth-*o*-aniside (2 mol.)

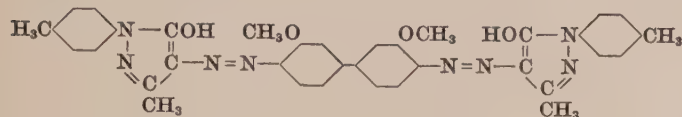
FIAT 764 — Blau 4022

Very slightly soluble in ethanol
 Insoluble in water

21200 C.I. Pigment Red 41 (Red)

o-Dianisidine \Rightarrow 3-Methyl-1-phenyl-5-pyrazolone (2 mol.)

Very slightly soluble in ethanol
Insoluble in water

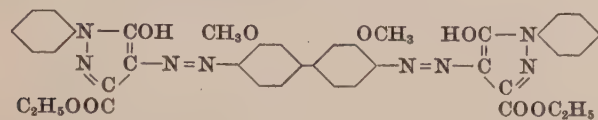
21205 C.I. Pigment Red 37 (Yellowish red)*

o-Dianisidine \Rightarrow 3-Methyl-1-*p*-tolyl-5-pyrazolone (2 mol.)

* In rubber

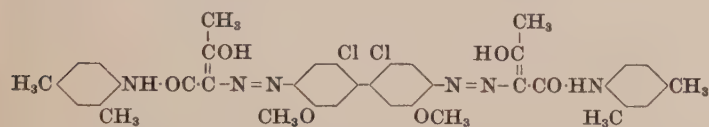
BIOS 1661, 160
FIAT 764 — Vulcanectrot G
FIAT 1313, 2, 501

Insoluble in water
Slightly soluble in ethanol and xylene

21210 C.I. Pigment Red 42 (Bordeaux)

o-Dianisidine \Rightarrow 3-Carboxyethyl-1-phenyl-5-pyrazolone (2 mol.)

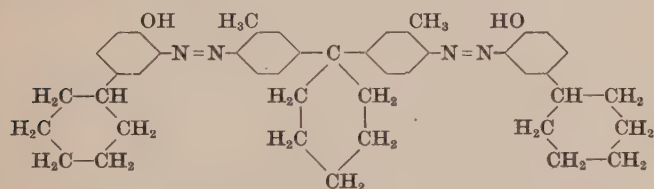
Very slightly soluble in ethanol
Insoluble in water

21220 C.I. Pigment Yellow 15 (Greenish yellow)*

2,2'-Dichloro-5,5'-dimethoxybenzidine \Rightarrow 2,4-Acetoacetoxydide (2 mol.)

* In rubber

BIOS 1661, 163
FIAT 764 — Vulcanecthtgelb 5G

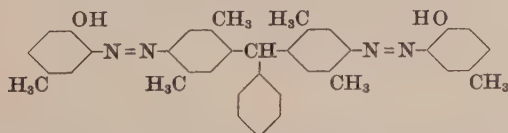
21230 C.I. Solvent Yellow 29 (Greenish yellow)*

4,4'-Cyclohexylidenedi-*o*-toluidine \Rightarrow *p*-Cyclohexylphenol (2 mol.)

* As lacquer coating

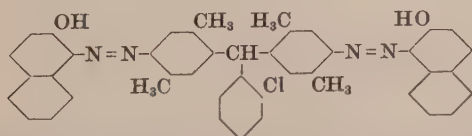
Similar dyes —
Geigy, USP 1819957
FIAT 764 — Sudangelb GRN

Soluble in acetone
Slightly soluble in ethanol
H₂SO₄ conc. — reddish orange; on dilution — yellow solution then orange ppt.
H₂SO₄ 10% — insoluble
HCl conc. — insoluble
HNO₃ conc. — orange solution, fades
NaOH 10% — insoluble

21240 C.I. Solvent Yellow 30 (Greenish yellow)

4,4'-Benzylidenedi-2,5-xylidine \Rightarrow *p*-Cresol (2 mol.)

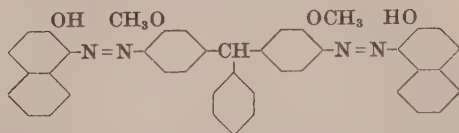
Insoluble in water
Soluble in ethanol, acetone and benzene
H₂SO₄ conc. — orange red to brown; on dilution — yellow (brown ppt.)
NaOH conc. — almost insoluble

21250 C.I. Solvent Red 22 (Yellowish red)*

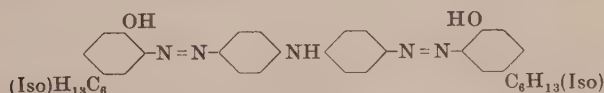
4,4'-(*o*-Chlorobenzylidene)di-2,5-xylidine \Rightarrow 2-Naphthol (2 mol.)

* As lacquer coating

Soluble in ethanol, acetone and benzene
Insoluble in water
H₂SO₄ conc. — greenish yellow; on dilution — orange
NaOH conc. — insoluble

21260 C.I. Solvent Red 18 (Yellowish red)4,4'-Benzylidenedi-*o*-anisidine \rightleftharpoons 2-Naphthol (2 mol.)

Slightly soluble in ethanol
Soluble in acetone and benzene
Insoluble in water
 H_2SO_4 conc. — yellowish green; on dilution — orange
 NaOH conc. — insoluble

21270 Solvent Dye4,4'-Diaminodiphenylamine \rightleftharpoons *p*-Isohexylphenol (2 mol.)**Sudan Brown 3RX (IG)**

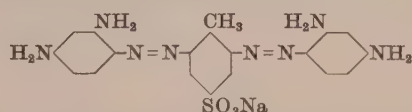
Soluble in oils, fat and waxes
FIAT 764 — Sudanbraun 3RX

21280 Direct Dye4,4'-Diaminothiocarbanilide \rightleftharpoons Phenol (2 mol.)

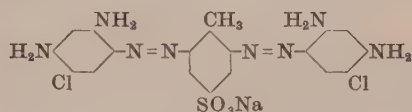
Discoverers — Prager and Istel 1890

Heligoland Yellow (NI)Griesheim-Elektron, *GP* 58204, 60152, (*Fr.* 3, 31, 32)

Soluble in water (yellow)
 H_2SO_4 conc. — orange red; on dilution — brown ppt.
Aqueous solution + HCl — brown ppt;
+ NaOH — redder

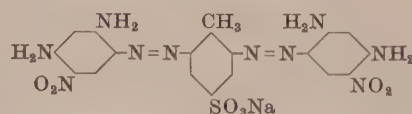
21500 C.I. Direct Brown 184 (Brown)*3,5-Diamino-*p*-toluenesulfonic acid \rightleftharpoons *m*-Phenylenediamine (2 mol.)* Coupled with diazotised *p*-nitroanilineOehler, *FP* 199658; *GP* 51662 (*Fr.* 2, 369)*FIAT* 764 — Paranilbraun R ex.

Soluble in water (reddish yellow to reddish orange)
Moderately soluble in ethanol
 H_2SO_4 conc. — olive brown; on dilution — reddish yellow
Aqueous solution + HCl conc. — orange brown, ppt;
+ NaOH conc. — unchanged

21505 Direct Dye3,5-Diamino-*p*-toluenesulfonic acid \rightleftharpoons 4-Chloro-*m*-phenylenediamine (2 mol.)Oehler, *FP* 199658; *GP* 51662 (*Fr.* 2, 369)**Paranil Brown G (By)**

Fastness Properties (C): coupled with diazotised *p*-nitroaniline: Acid (organic) 4, Alkali 4, Light 2,
Washing 3, Water 3-4
Dischargeability, fairly good

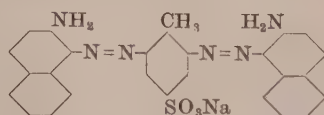
Moderately soluble in water (orange brown)
Soluble in ethanol (golden yellow)
 H_2SO_4 conc. — magenta red; on dilution — reddish yellow
Aqueous solution + HCl conc. — brown, ppt;
+ NaOH conc. — unchanged

21510 C.I. Direct Yellow 25 (Reddish yellow)3,5-Diamino-*p*-toluenesulfonic acid \rightleftharpoons 4-Nitro-*m*-phenylenediamine (2 mol.)

Discoverers — C. Rudolph and E. Voges 1894

Oehler, *BP* 1331/96; *USP* 568549; *GP* 86940 (*Fr.* 4, 993)*FIAT* 764 — Toluyhengelb

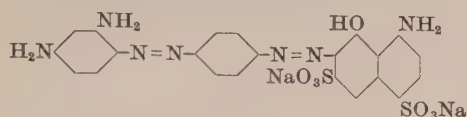
Soluble in water (yellowish brown)
 H_2SO_4 conc. — brown; on dilution — brown ppt.
Aqueous solution + HCl — brown, ppt;
+ NaOH — soluble brown ppt.

21515 Direct Dye3,5-Diamino-*p*-toluenesulfonic acid \rightleftharpoons 2-Naphthylamine (2 mol.)

Discoverer — C. Rudolph 1891

Triazol Orange RR (Gr E)Oehler, *BP* 17546/92; *USP* 497032; *GP* 70147 (*Fr.* 3, 741)

Soluble in water (yellowish red) and ethanol (orange)
 H_2SO_4 conc. — bluish grey; on dilution — brownish red ppt.
Aqueous solution + HCl — brownish red, ppt;
+ NaOH — yellowish red ppt.

21530 C.I. Direct Black 90 (Black)*

p-Aminooxanilic acid
 (1) *m*-Phenylenediamine
 (2) hydrolyse oxamic acid group → (3) (alk.) K acid

* Coupled with diazotised *p*-nitroaniline

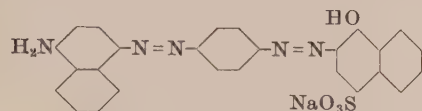
Discoverer — M. Kahn 1909

Para Black R (By)

Bayer Co., USP 936456

FIAT 764 — Paranilschwarz R, error for Paraschwarz R
 PB 74753, fr. 2332

Moderately soluble in water (dull violet)
 Very slightly soluble in ethanol
 H₂SO₄ conc. — greenish blue; on dilution — pale brown
 Aqueous solution + HCl conc. — corinth, ppt;
 + NaOH conc. — violet

21535 Direct Dye

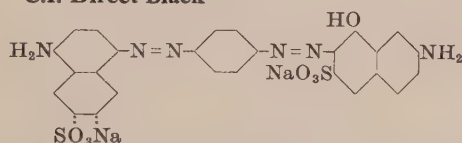
p-Aminoacetanilide
 1-Naphthylamine
 hydrolyse amide group → Neville and Winther's acid

Discoverer — C. Bülow 1887

Violet Black (B)

Under C.I.338 (1st Edition) this is claimed to be the first black substantive (direct) dye
 Badische Co., GP 42011 (Fr. 2, 444), GP 42815 (Fr. 1, 524)

Soluble in water (brownish red)
 H₂SO₄ conc. — blue; on dilution — violet ppt.
 Aqueous solution + HCl — violet, ppt;
 + NaOH — violet solution

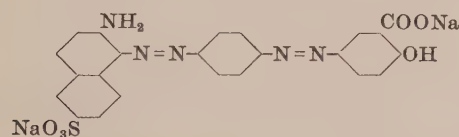
21540 C.I. Direct Black*

p-Aminoacetanilide
 (1) 1,6(and 1,7)-Cleve's acid
 (2) hydrolyse amide group → (3) (alk.) Gamma acid

Ingrain Black C (H)

May be developed with toluene-2,4-diamine

Soluble in water (dark wine red)
 Insoluble in ethanol
 H₂SO₄ conc. — blue; on dilution — violet, ppt.
 Aqueous solution + HCl — violet, ppt;
 + NaOH — unaltered

21545 Mordant Dye

p-Aminoacetanilide
 (1) Salicylic acid
 (2) hydrolyse amide group → (3) Broenner's acid

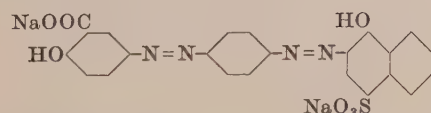
Discoverer — Brotherton Ltd. 1919

Chrome Red S pdr. (Br)

Wool dyed bluish red, by either the mordant or meta-chrome process, of moderate fastness to light, good fastness to milling and alkalies and excellent fastness to washing and potting

Brotherton Ltd. & Merriman, BP 155410

Soluble in water
 H₂SO₄ conc. — dark blue; on dilution — brown solution and ppt.
 Aqueous solution + HCl — brown ppt;
 + NaOH — unaltered

21550 Mordant Dye (Red)

p-Aminoacetanilide
 (1) Salicylic acid
 (2) hydrolyse amide group → (3) Neville and Winther's acid

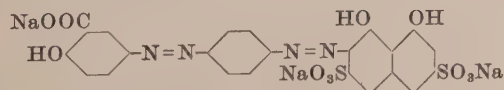
Discoverer — C. Müller 1898

Azo Alizarine Bordeaux W (DH)

Applied afterchrome alone and in combinations for fast-to-processing and wearing dyeings on loose wool, slubbing and yarn

Durand & Huguenin, BP 1033/99; USP 631089; FP 284775;
 GP ap. D9290 (Fr. 5, 519)

Soluble in water (magenta red)
 H₂SO₄ conc. — blue; on dilution — magenta red ppt.
 Aqueous solution + HCl — magenta red ppt;
 + NaOH — violet red

21555 Mordant Dye

p-Aminoacetanilide
 (1) Salicylic acid
 (2) hydrolyse amide group → (3) Chromotropic acid

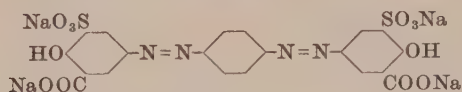
Discoverer — C. Müller 1898

Azo Alizarine Black I (DH) may be dyed by the mordant or afterchrome process. Fast to light

Durand & Huguenin, BP 1033/99; USP 628721, 640010;
 FP 284775; GP ap. D9290 (Fr. 5, 519)

Soluble in water (dark crimson)
 H₂SO₄ conc. — blue; on dilution — violet ppt.
 Aqueous solution + HCl — maroon ppt;
 + NaOH — violet solution

21570 C.I. Mordant Orange 22 (Orange)



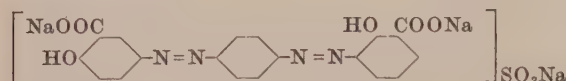
p-Nitroaniline $\xrightarrow{\text{Salicylic acid}}$
 reduce nitro group \rightarrow Salicylic acid;
 and finally sulfonate

Discoverers — W. Neelmeier and W. Rebner 1926
 I.G., BP 289135; USP 1660625; FP 630819; GP 454177 (Fr. 16, 964)
 BIOS 1548, 95
 FIAT 764 — Azoldruckorange R

Soluble in water (golden yellow)
 Insoluble in ethanol
 H₂SO₄ conc. — reddish violet; on dilution — greenish to golden yellow
 Aqueous solution + HCl conc. — greenish to golden yellow;
 + NaOH conc. — ruby red

21571 C.I. Direct Orange 104 (Orange)

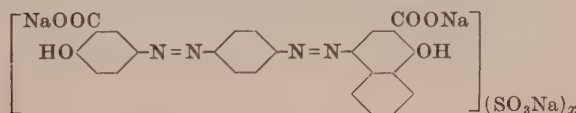
Possible constitution



Condense *p*-Nitroaniline \rightarrow Salicylic acid with 3-aminosalicylic acid
 and sulfonate the product

BIOS 1548, 100
 FIAT 764 — Ergansogaorange R

21575 C.I. Direct Brown 179 (Dull reddish brown)*



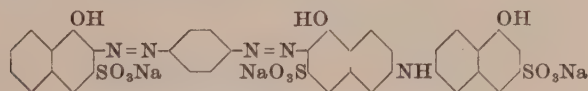
p-Nitroaniline $\xrightarrow{(1) \text{ Salicylic acid}}$
 $\xrightarrow{(2) \text{ reduce nitro group}}$ \rightarrow (3) 1-Hydroxy-2-naphthoic acid;
 and finally sulfonate

* With chromium salts

Discoverer — F. Suckfüll 1940
 FIAT 764 — Ergansoga Merah Toeah 4RG

Very soluble in water (yellow to orange brown)
 Very slightly soluble in ethanol
 H₂SO₄ conc. — blue; on dilution — greyish olive
 Aqueous solution + HCl conc. — bluish grey ppt;
 + NaOH conc. — violet

21580 Direct Dye



p-Aminoacetanilide $\xrightarrow{(1) \text{ 1-Naphthol-3-sulfonic acid}}$
 $\xrightarrow{(2) \text{ hydrolyse amide group}}$ \rightarrow (3) 6,6'-Iminobis-1-naphthol-3-sulfonic acid

Discoverer — P. Volkmann 1909

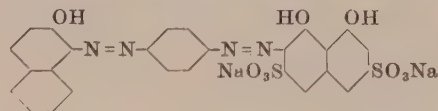
Para Blue RRX (By)

Fastness Properties (C), coupled with diazotised *p*-nitroaniline: Acid (organic) 4, Alkali 5, Light 1, Washing 2-3, Water 3
 Dischargeability, fairly good

Bayer Co., BP 11253/09; USP 1020670; FP 411599; GP 218255 (Fr. 10, 899)

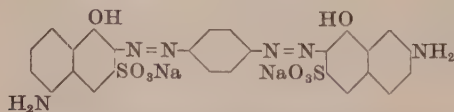
Soluble in water (violet)
 Very slightly soluble in ethanol
 H₂SO₄ conc. — greenish blue; on dilution — violet
 Aqueous solution + HCl conc. — reddish violet ppt;
 + NaOH conc. — dullish violet

21590 C.I. Mordant Blue 6 (Navy)



p-Nitroaniline $\xrightarrow{(2) \text{ reduce nitro group}}$ \rightarrow (3) 2-Naphthol
 $\xrightarrow{(1) \text{ Chromotropic acid}}$

21600 Direct Dye



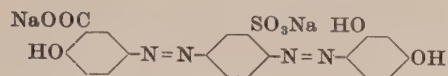
p-Aminoacetanilide $\xrightarrow{(1) (alk.) \text{ M acid (5-Amino-1-naphthol-3-sulfonic acid)}}$
 $\xrightarrow{(2) \text{ hydrolyse the amide group}}$ \rightarrow (3) Gamma acid

Oxamine Black RN (B)

May be developed with 2-naphthol or toluene-2,4-diamine
 FIAT 764 — Oxaminschwarz RN

This is a mixed dye of which the principal components are C.I.21600 and C.I.27750. Some trisazo dye is also present due to tetrazotisation at stage (3) in C.I.21600 and the use of a corresponding additional amount of Gamma acid

21610 C.I. Direct Red 185 (Dull red → Reddish brown)*



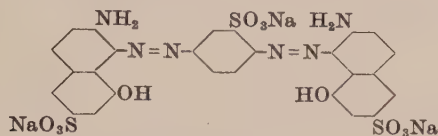
4'-Amino-2'-sulfooxanilic acid
 (1) Salicylic acid
 (2) hydrolyse the oxamic acid group → (3) Resorcinol

* With chromium salts

Discoverers — W. Neelmeier and R. Fischer 1923
 Bayer Co., GP 408294 (Fr. 14, 1091)
 FIAT 764 — Chromsogarot 29426

Soluble in water (orange brown)
 Slightly soluble in ethanol
 H₂SO₄ conc. — violet; on dilution — pale orange brown
 Aqueous solution + HCl conc. — orange brown ppt;
 + NaOH conc. — dullish violet

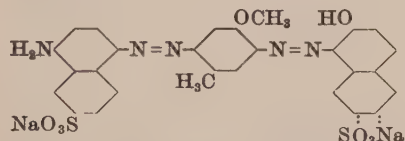
21620 C.I. Direct Blue 96 (Greenish blue)



2-Amino-5-nitrobenzenesulfonic acid
 (1) (acid) Gamma acid
 (2) reduce the nitro group → (3) (acid) Gamma acid

Soluble in water (blue)
 Insoluble in ethanol
 H₂SO₄ conc. — dull bluish green; on dilution — reddish violet
 ppt.
 HNO₃ conc. — dark red
 Aqueous solution + HCl — violet ppt;
 + NaOH — reddish violet

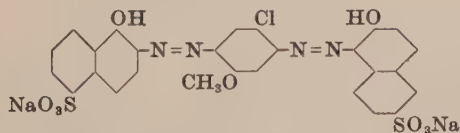
21630 Direct Dye



5-Methyl-4-nitro-*o*-anisidine
 (2) reduce the nitro group → (3) 1,7-Cleve's acid
 (1) F acid (2-Naphthol-7-sulfonic acid)
 + Schaeffer's acid

Naphthogene Sky Blue 4B (IG)
 FIAT 764 — Naphthogenreinblau 4B

21640 C.I. Acid Blue 44 (Reddish navy)

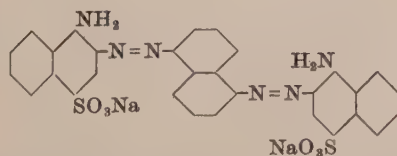


4'-Amino-5'-chloro-2'-methoxyoxanilic acid
 (2) hydrolyse the oxamic acid group → (3) 1-Naphthol-5-sulfonic acid
 (1) Schaeffer's acid

Discoverer — E. Fellmer 1922
Foulard Discharge Blue B (By)
 Bayer Co., USP 1784343; GP 411476 (Fr. 15, 523)
 FIAT 764 — Foulardaetzblau B

Soluble in water (deep violet)
 Very slightly soluble in ethanol
 H₂SO₄ conc. — bluish green; on dilution — violet
 Aqueous solution + HCl conc. — dullish deep violet;
 + NaOH conc. — deep blue

21650 Direct Dye

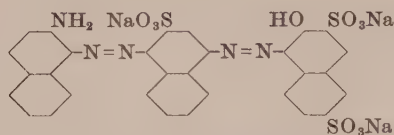


1,5-Naphthalenediamine ⇌ Naphthionic acid (2 mol.)

Discoverer — A. Römer 1886
Naphthylene Red (B)
 Badische Co., BP 14625/86; USP 359576; GP 39954 (Fr. 1, 525)

Soluble in water (red)
 H₂SO₄ conc — blue; on dilution — bluish black ppt.
 HCl — violet black ppt.

21660 Acid Dye



1,4-Diamino-2-naphthalenesulfonic acid
 (3) 2-Naphthylamine
 (1) monodiazotise → (2) R acid

(By heating 1,4-diamino-2-naphthalenesulfonic acid with sodium nitrite

and acetic acid the monodiazonium compound results)

Discoverer — R. Herz 1895

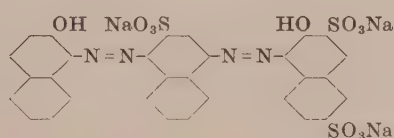
Coomassie Black B (Lev)

Dyes wool from an acetic acid dyebath

Levinstein Ltd., BP 2946/96, 17064/96, 17065/96, 12119/98;
 USP 619194, 629748, 634009; FP 256862, 281728; GP *ap.*
 C5939 (*Fr.* 4, 583), GP 102160 (*Fr.* 5, 508)

Soluble in water (blue black); insoluble in ethanol
 H₂SO₄ conc. — greenish blue; on dilution — dull red
 Aqueous solution + HCl — violet;
 + NaOH conc. — unaltered

21670 Acid Dye



1,4-Diamino-2-naphthalenesulfonic acid
 (3) 2-Naphthol
 (1) monodiazotise → (2) R acid

(See note on C.I.21660)

Discoverer — R. Herz 1895

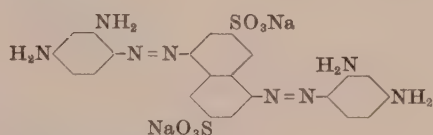
Coomassie Navy Blue (Lev)

Dyes wool from an acetic acid dyebath or wool and silk
 from a neutral dyebath

Levinstein Ltd., BP 2946/96; USP 619194, 629748, 634009;
 FP 256862; GP 102160 (*Fr.* 5, 508)

Soluble in water (dark blue)
 H₂SO₄ conc. — bluish green; on dilution — dark blue
 NaOH — violet solution

21680 Direct Dye



4,8-Diamino-2,6-naphthalenedisulfonic acid
 ⇒ *m*-Phenylenediamine (2 mol.)

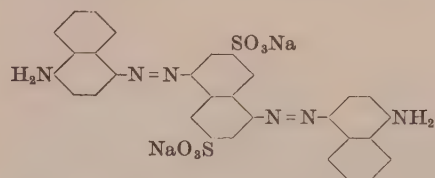
Discoverer — Cassella Co.

Diamine Nitrazol Brown B (C)

Fastness Properties (C), coupled with diazotised *p*-nitro-
 aniline: Acid 3-4, Alkali 5, Light 2, Washing 3,
 Water 4

Dischargeability: neutral, good-very good; alkaline, fairly
 good

21690 Direct Dye



4,8-Diamino-2,6-naphthalenedisulfonic acid
 ⇒ 1-Naphthylamine (2 mol.)

Discoverer — M. Hoffmann 1890

Diamine Cutch (C)

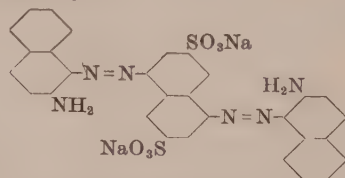
Fastness Properties (C), diazotised and treated with sodium
 carbonate: Acid (organic) 3, Alkali 4, Light 1,
 Washing 2-3, Water 3

Dischargeability: neutral and alkaline, poor

Cassella Co., BP 15346-7/90; USP 464566, 473928; FP 208526,
 208570; GP 62075, 68171, (*Fr.* 3, 726, 785)
 FIAT 764 — Diaminkatechu

Moderately soluble in water (corinth) and ethanol (red)
 H₂SO₄ conc. — violet black; on dilution — dullish violet
 Aqueous solution + HCl conc. — violet ppt;
 + NaOH conc. — orange red brown ppt.

21700 Direct Dye



4,8-Diamino-2,6-naphthalenedisulfonic acid
 ⇒ 2-Naphthylamine (2 mol.)

Discoverer — Cassella Co.

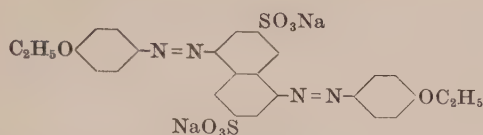
Diamine Violet Red (C)

Fastness Properties (C): Acid (organic) 1, Alkali 4,
 Light 1, Washing 1, Water 2

Dischargeability: neutral, fairly good; alkaline, good

FIAT 764 — Diaminviolettrot

Soluble in water (magenta red) and ethanol (red)
 H₂SO₄ conc. — grey; on dilution — yellowish brown
 Aqueous solution + HCl conc. — corinth ppt;
 + NaOH conc. — bordeaux ppt.

21710 Direct Dye

4,8-Diamino-2,6-naphthalenedisulfonic acid $\xrightarrow{\text{Phenol (2 mol.)}}$ and finally ethylate the hydroxy groups

Aqueous solution + HCl — brown ppt, blackened by large excess

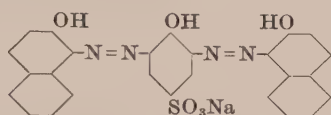
Discoverer — M. Hoffmann 1890

Diamine Gold (C)

Fastness Properties: Acid and alkali, very good
Dischargeability, very good

Cassella Co., BP 15346/90; USP 472121, 498882; FP 182063, 208526; GP 61174 (Fr. 3, 483)
Meyer and Schäffer, Ber. 27 (1894), 3358
Meyer and Maier, Ber. 36 (1903), 2977
Fierz-David, 165

Soluble in water (orange yellow) and ethanol (yellow)
H₂SO₄ conc. — reddish violet; on dilution — green ppt; then brown ppt.

21720 C.I. Mordant Black 10 (Dull bluish black)

(a) Tetrazotise 3,5-diamino-4-chlorobenzenesulfonic acid, make faintly alkaline with caustic soda in order to replace the chloro by a hydroxy group, then:

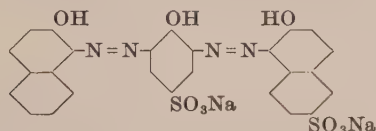
2,6-Diamino-1-phenol-4-sulfonic acid $\xrightarrow{\text{2-Naphthol (2 mol.)}}$ or

(b) Tetrazotise 2,6-diamino-1-phenol-4-sulfonic acid directly and couple with 2-naphthol (2 mol.)

Discoverers — K. Schirmacher; P. Julius 1900

M.L.B., BP 18624/00; USP 665696; FP 304694; GP 147880, 148213, (Fr. 7, 392, 395)
Badische Co., BP 2397/01, 16811/01; USP 677231; FP 308558, 313671; GP 150373 (Fr. 7, 383)
Brenner, Helv. Chim. Acta, 3 (1920), 98

Soluble in water (dark blue)
Slightly soluble in ethanol
H₂SO₄ conc. — violet to reddish blue; on dilution — bluish red ppt.
Aqueous solution + HCl conc. — cherry red solution and red ppt; + NaOH conc. — reddish violet solution, blackish ppt; + NaOH 10% — blue

21725 C.I. Mordant Black 25 (Bluish black)

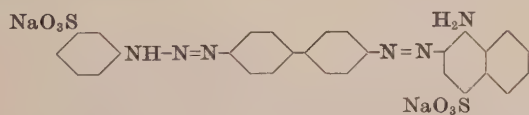
Tetrazotise 3,5-diamino-4-chlorobenzenesulfonic acid, make faintly alkaline with caustic soda in order to replace the chloro by a hydroxy group, then:

2,6-Diamino-1-phenol-4-sulfonic acid $\xrightarrow{\text{(2) 2-Naphthol}}$
 $\xrightarrow{\text{(1) Schaeffer's acid}}$

Discoverers — K. Schirmacher 1900; P. Julius 1901

M.L.B., BP 18624/00; USP 680283; FP 310957; GP 148212 (Fr. 7, 393)
Badische Co., BP 2397/01, 16811/01; USP 677227; FP 308000, 313671; GP 150373 (Fr. 7, 383)
FIAT 764 — Saeurealizarinschwarz SN

Soluble in water (violet to greyish blue)
Slightly soluble in ethanol (weak dullish violet)
Insoluble in acetone
H₂SO₄ conc. — deep violet; on dilution — brownish orange
Aqueous solution + HCl conc. — brownish orange; + NaOH conc. — violet

22000 Direct Dye

Benzidine $\xrightarrow{\text{Metanilic acid}}$
 $\xrightarrow{\text{Naphthionic acid}}$

Discoverers — C. Martius, Pfaff 1885

Congo GR (A)

Dyes cotton red, very sensitive to acids

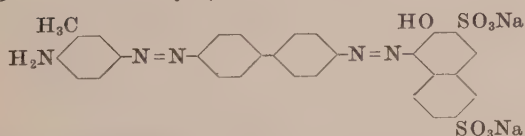
Agfa, BP 2213/86; USP 344971, 358865; FP 160722, 163172; GP 40954 (Fr. 1, 483)

Soluble in water (brownish red)
H₂SO₄ conc. — blue; on dilution — blue ppt.
Aqueous solution + HCl — blue ppt; + NaOH — unaltered

22010 C.I. Direct Yellow 24 (Dull reddish yellow)

Benzidine $\xrightarrow{\text{Sulfanilic acid}}$
 $\xrightarrow{\text{Salicylic acid}}$

Soluble in water and ethanol (dull yellow)
Slightly soluble in acetone
H₂SO₄ conc. — dull red; on dilution — yellow, yellowish brown ppt.
HNO₃ conc. — dull yellowish red
Aqueous solution + HCl conc. — dull brown; + NaOH conc. — rather dull orange

22020 Direct Dye (Dull reddish blue)

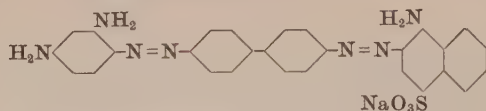
Benzidine $\xrightarrow{\text{o-Toluidine}}$
 $\xrightarrow{\text{R acid}}$

Discoverer — M. Kahn 1893

Diazo Violet R (By)

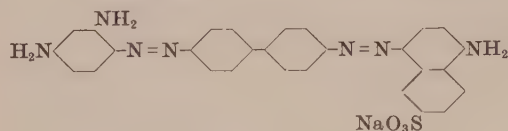
Dischargeability: neutral, poor; alkaline, fairly good

Bayer Co., BP 9972/93; FP 231037; GP 79816 (Fr. 4, 941)

22030 C.I. Direct Brown 86 (Brown)

Benzidine \swarrow *m*-Phenylenediamine
 \searrow Naphthionic acid

H₂SO₄ conc. — dark reddish blue; on dilution — reddish blue ppt.
 HNO₃ conc. — brown solution
 Aqueous solution + NaOH — unaltered

22035 Direct Dye

Benzidine \swarrow *m*-Phenylenediamine
 \searrow 1,6-Cleve's acid

Discoverers — C. Duisberg and P. Ott 1891

Diazo Brown R Extra (By)

Fastness Properties (C): developed with methylphenyl-pyrazolone: Acid (organic) 4, Alkali 5, Light 2, Washing 3, Water 3-4

Bayer Co., BP 22641/91; USP 523809; FP 213971; GP 65262 (Fr. 3, 763)

Soluble in water (orange brown)
 Slightly soluble in ethanol
 H₂SO₄ conc. — deep violet; on dilution — corinth
 Aqueous solution + HCl conc. — corinth, ppt;
 + NaOH conc. — orange brown, ppt.

22040 C.I. Direct Brown 56 (Dull reddish brown → Dull bordeaux)

Benzidine \swarrow *m*-Phenylenediamine
 \searrow (alk.) Gamma acid

Discoverer — L. Gans 1889

Cassella Co., FP 201770; GP 57856 (Fr. 5, 955)

FIAT 764 — Diaminbraun V

Soluble in water (red); moderately soluble in ethanol
 H₂SO₄ conc. — dark navy blue; on dilution — corinth
 Aqueous solution + HCl conc. — corinth, ppt;
 + NaOH conc. — orange brown, ppt.

22045 C.I. Direct Brown 165 (Brown)*

Benzidine \swarrow (2) *m*-Phenylenediamine
 \searrow (1) (acid) H acid

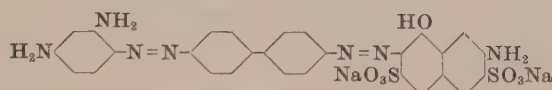
* Coupled with diazotised *p*-nitroaniline

Discoverer — Cassella Co. 1889

Soluble in water (bluish red)
 H₂SO₄ conc. — bluish green; on dilution — violet ppt.
 Aqueous solution + HCl — violet brown ppt; + NaOH — cherry red

22046 C.I. Direct Violet 88

Benzidine \swarrow *m*-Phenylenediamine
 \searrow (alk.) H acid

Cresotine Dark Violet (Pol)**22050 Direct Dye**

Benzidine \swarrow (2) *m*-Phenylenediamine
 \searrow (1) (alk.) 2R acid

Discoverer — Cassella Co. 1907

Diamine Brown S (C)

Fastness Properties (C): Acid (organic) 4, Alkali 4, Light 2, 3, 3, Washing 1-2, Water 2-3. Dischargeability; neutral, good — very good. May be developed with 2-naphthol or toluene-2,4-diamine

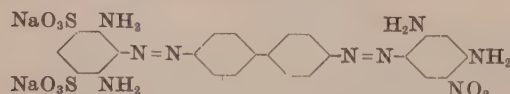
Dyes of similar constitution —

GP 57857 (Fr. 5, 955)

FIAT 764 — Diaminbraun S

Soluble in water (corinth); very slightly soluble in ethanol (pale brown)

H₂SO₄ conc. — dark blue; on dilution — corinth

22060 Direct Dye (Yellowish orange)

Benzidine \swarrow (1) 4,6-Diamino-*m*-benzenedisulfonic acid
 \searrow (2) 4-Nitro-*m*-phenylenediamine

Discoverers — A. Bernthsen and P. Julius 1898

Pyramine Orange 3G (B)

Fastness Properties (C): Acid (organic) 2, Alkali 4, Light 2, Washing 1-2, Water 2. Dischargeability, fairly good

Badische Co., BP 18506/98; USP 631610; FP 280914; GP 105349 (Fr. 5, 616)

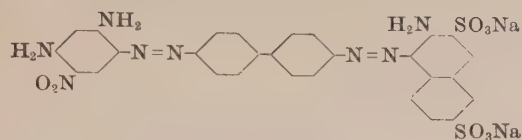
FIAT 764 — Pyraminorange 3G

Moderately soluble in water (golden orange); very slightly soluble in ethanol (golden yellow)

H₂SO₄ conc. — yellowish olive brown; on dilution — brownish orange

Aqueous solution + HCl conc. — brownish orange;
 + NaOH conc. — orange

22070 Direct Dye (Bright orange)



Benzidine \leftarrow (2) 4-Nitro-*m*-phenylenediamine
 (1) 3-Amino-2,7-naphthalenedisulfonic acid

Discoverers — A. Bernthsen and P. Julius 1899

Pyramine Orange RR (B)

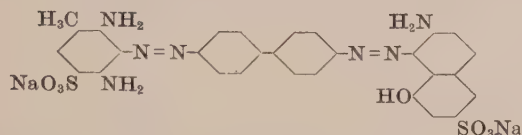
Fastness Properties (C): Acid (organic) 3, Alkali 4, Hot Pressing 3-4, Light 2, 2, 3, Washing 1-2, Water 2
 Dischargeability: neutral, good

Badische Co., BP 6827/99; USP 631611; FP 280194; GP 107731 (Fr. 5, 617)

Moderately soluble in water (brownish orange) and ethanol (golden yellow to yellowish brown)

H₂SO₄ conc. — navy blue; on dilution — reddish brown
 Aqueous solution + HCl conc. — yellowish brown, ppt;
 + NaOH conc. — brownish orange, ppt.

22080 Direct Dye



Benzidine \leftarrow 4,6-Diamino-*m*-toluenesulfonic acid
 (acid) Gamma acid

Discoverer — Agfa

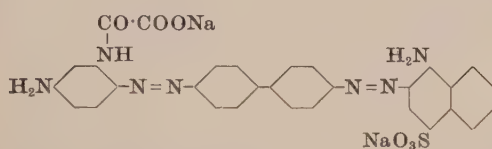
Paranil Bordeaux B (A)

Fastness Properties (C), Coupled with diazotised *p*-nitro-aniline: Acid (organic) 2, Alkali 4, Light 1, Washing, 3, Water 3

Moderately soluble in water (scarlet); slightly soluble in ethanol (bright bluish red)

H₂SO₄ conc. — dark blue; on dilution — bright bluish violet
 Aqueous solution + HCl conc. — bordeaux, ppt; + NaOH conc. — reddish brown, ppt.

22090 Direct Dye



Benzidine \leftarrow (2) *m*-Aminooxanilic acid
 (1) Naphthionic acid

Discoverer — Markfeldt 1894

Oxamine Scarlet B (R)

May be diazotised and developed on the fibre

Remy, BP 22114/95; FP 252140; GP 86791-2 (Fr. 4, 961, 958)

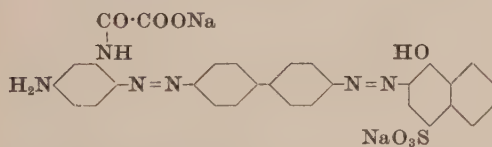
Soluble in water (red)

Slightly soluble in ethanol

H₂SO₄ conc. — blue; on dilution — violet ppt.

Aqueous solution + HCl — violet black ppt;
 + NaOH — unaltered

22095 Direct Dye



Benzidine \leftarrow *m*-Aminooxanilic acid
 Neville and Winther's acid

Discoverer — Markfeldt 1894

Oxamine Red B (R)

May be diazotised and developed on the fibre

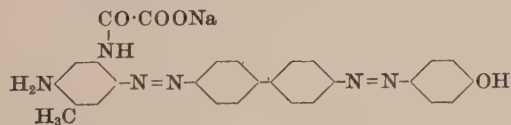
Remy, BP 22114/95; FP 252140; GP 86791-2 (Fr. 4, 961, 958)

Soluble in water (red) and in ethanol (red)

H₂SO₄ conc. — blue; on dilution — bluish red ppt.

Aqueous solution + HCl — brownish red ppt;
 + NaOH — clear cherry red

22100 Direct Dye



Benzidine \leftarrow 3-Amino-4-methyloxanilic acid
 Phenol

Discoverer — Markfeldt 1894

Oxamine Orange G (R)

May be diazotised and developed on the fibre

Remy, BP 22114/95; FP 252140; GP 86791-2 (Fr. 4, 961, 958)

Soluble in hot water, insoluble cold; soluble in ethanol

H₂SO₄ conc. — violet; on dilution — reddish brown ppt.

Aqueous solution + HCl — brownish red ppt;
 + NaOH — darker

22110 Direct Dye



Benzidine \leftarrow 1-Naphthylamine
 (alk.) H acid

Discoverers — M. Ulrich and J. Bammann (Bayer Co.) 1896

Diazo Black R Extra (By)

Fastness Properties, developed with 2-naphthol or toluene-2,4-diamine: Acid (organic) and Alkali, very good; Light moderate; Washing, fair; Water, fairly good

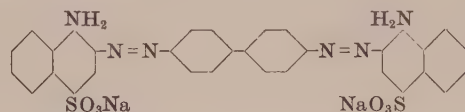
FIAT 764 — Diazoschwarz R ex

Soluble in water (blackish violet)

Slightly soluble in ethanol (pale magenta)

H₂SO₄ conc. — deep blue; on dilution — violet

Aqueous solution + HCl conc. — dark violet, ppt;
 + NaOH conc. — dark corinth, ppt.

22120 C.I. Direct Red 28 (Yellowish red)Classical name **Congo Red**Benzidine \rightarrow Naphthionic acid (2 mol.)

Soluble in water (yellowish red) and ethanol (orange); very slightly soluble in acetone

 H_2SO_4 conc. — deep blue; on dilution — paler blue, blue ppt.Aqueous solution + HCl conc. — reddish blue ppt.; + Acetic acid — bluish violet, then reddish blue ppt.; + NaOH conc. — yellower

Discoverer — P. Böttiger 1884

Agfa, BP 4415/84; USP 365667; FP 160722; GP 28753 (Fr. 1, 470)
Badische Co., BP 6697/95, 17260/95; FP 248210; GP 84893
88597, (Fr. 4, 846, 854)

FIAT 764 — Congorot

Knecht, JSDC, 1 (1885), 146

Witt, Ber. 19 (1886), 1719

Vaubel, Farb. u. Textilchem. 4 (1905), 89

Schaposchnikoff, Farb. u. Textilchem. 11 (1912), 301

Lubs, Ind. Eng. Chem. 11 (1919), 456

Meyer, Ber. 53 (1920), 1275

Vaubel, Chemikerztg. 48 (1924), 165

Seyewetz & Chaix, Bull. Soc. chim. 41 (1927), 332

Weiser & Radcliffe, J. Phys. Chem. 32 (1928), 1875

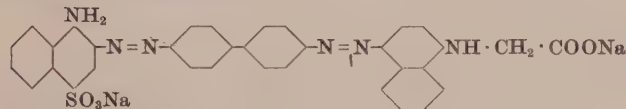
Pauli & Weiss, Biochem. Z. 203 (1928), 103

Pauli, Koll. Z. 51 (1930), 27

Parks & Keller, Amer. Dyes. Rep. 23 (1934), 445

Marting & Bang, J. Amer. Pharm. Assoc., Sci. Ed. 37 (1948), 102

Hantzsch, Ber. 48 (1915), 158 (indicator properties)

22125 Direct DyeBenzidine \rightarrow Naphthionic acid
 \rightarrow N-1-Naphthylglycine

Discoverer — Kinziberger & Co. 1891

Glycine Red (Ki)

Formerly used as a photographic sensitiser

BP 21949/91; GP 74775 (Fr. 3, 707)

Soluble in water (yellowish red) and ethanol (red)

 H_2SO_4 conc. — blue; on dilution — violet ppt.Aqueous solution + HCl — violet ppt; + NaOH conc. — yellowish red ppt.**22130 C.I. Direct Orange 8 (Reddish orange)**Benzidine \rightarrow (2) Naphthionic acid
 \rightarrow (1) Salicylic acid

In some brands part of the salicylic acid is replaced by 2,3-cresotic acid (C.I. 22140) and part of the naphthionic acid by other aminonaphthalenesulfonic acids (C.I. 22165)

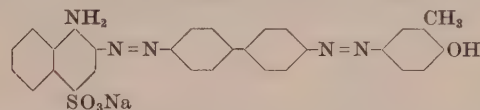
Discoverer — C. Duisberg 1887

Bayer Co., BP 2213/86; USP 447303; GP 44797 (Fr. 2, 349)

FIAT 764 — Benzoorange R

Moderately soluble in water (orange brown) and ethanol (brownish orange);

Slightly soluble in Cellosolve and acetone; insoluble in other organic solvents

 H_2SO_4 conc. — deep reddish blue; on dilution — pale corinth, ppt.Aqueous solution + HCl conc. — corinth, ppt;
+ NaOH conc. — orange, ppt.**22135 C.I. Direct Orange 25 (Reddish orange)**Benzidine \rightarrow Naphthionic acid
 \rightarrow o-Cresol

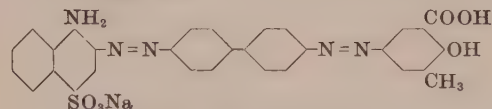
In some brands part of the o-cresol may be replaced by phenol and part of the naphthionic acid by other aminonaphthalenesulfonic acids

Discoverer — G. Schultz

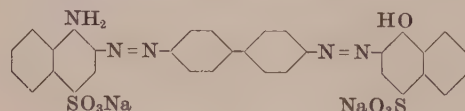
Agfa, FP 160722; GP 39096 (Fr. 1, 474)

Moderately soluble in water (orange brown)

Slightly soluble in ethanol (golden orange)

 H_2SO_4 conc. — dark blue; on dilution — dullish violetAqueous solution + HCl conc. — violet black, ppt;
+ NaOH conc. — yellowish orange brown**22140 Direct Dye**Benzidine \rightarrow (2) Naphthionic acid
 \rightarrow (1) 2,3-Cresotic acid

FIAT 764 — Benzoorange R (minor component)

22145 C.I. Direct Red 10 (Bordeaux)Benzidine \rightarrow (1) Naphthionic acid
 \rightarrow (2) Neville and Winther's acid

Discoverer — Pfaff 1885

Agfa, BP 15296/85, 2213/86; USP 344971, 358865; FP 160722;
GP 39096 (Fr. 1, 474)

BIOS 1548, 168

FIAT 764 — Congokorinth G

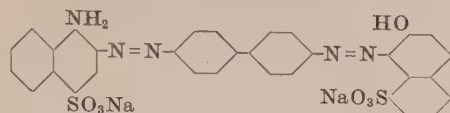
Lange, Ber. 19 (1886), 1697

Martius, Ber. 19 (1886), 1755

Soluble in water (wine red to bordeaux);

Slightly soluble in ethanol and Cellosolve; insoluble in other organic solvents

 H_2SO_4 conc. — blue; on dilution — pale violet (black, ppt.)Aqueous solution + HCl conc. — dull violet, ppt;
+ NaOH conc. — red, ppt.

22150 C.I. Direct Red 17 (Bluish red)

Benzidine \swarrow (2) Naphthionic acid
 \searrow (1) Crocein acid

Aqueous solution + HCl conc. — blue, ppt;
 + NaOH conc. — corinth, ppt.

Discoverer — G. Schultz 1891

Agfa, *GP* 62659 (*Fr.* 3, 696)

BIOS 1548, 168

FIAT 764 — Congorubin

Lüers, *Koll. Z.* 26 (1920), 123, 177

Haller, *Koll. Z.* 26 (1920), 188

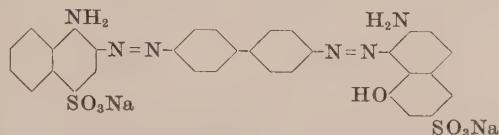
Ostwald & Rudolph, *Kolloidchem. Beih.* 30 (1930), 416

Pauli, *Koll. Z.* 51 (1930), 27

King, *JCS* (1932), 1267

Soluble in water (wine red)

Moderately soluble in ethanol; insoluble in other organic solvents
 H_2SO_4 conc. — blue; on dilution — pale reddish blue

22155 C.I. Direct Red 13 (Bordeaux)

Benzidine \swarrow (1) Naphthionic acid
 \searrow (2) (acid) Gamma acid

(In Diamine Bordeaux N (By) part of the Gamma acid was replaced by J acid)

Cassella Co., *FP* 201770; *GP* 57858 (*Fr.* 5, 955)

FIAT 764 — Diaminbordo B

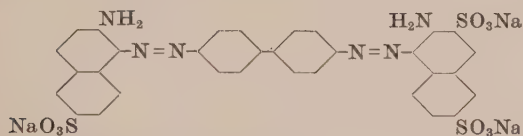
Soluble in water (wine red), ethanol (magenta red) and Cellosolve;
 insoluble in other organic solvents

H_2SO_4 conc. — blue; on dilution — corinth, ppt;

HNO_3 conc. — brownish yellow

Aqueous solution + HCl conc. — violet, ppt;

+ NaOH conc. — orange brown, ppt.

22160 Direct Dye

Benzidine \swarrow Broenner's acid
 \searrow 3-Amino-2,7-naphthalenedisulfonic acid

Discoverer — Krügener 1886

Brilliant Congo G (A)

Fastness Properties (C): Acid, fairly good; Alkali, very good;

Light and Washing, fair

Also dyes wool from a neutral dyebath, of good fastness to washing and stoving but of moderate fastness to light

Agfa, *BP* 6687/87; *FP* 160722; *GP* 41095 (*Fr.* 1, 476)

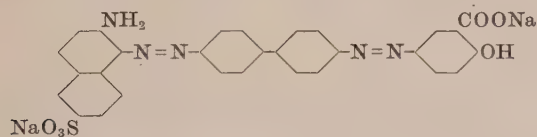
Soluble in water (brownish red)

H_2SO_4 conc. — blue; on dilution — violet ppt.

Aqueous solution + HCl — brownish violet ppt;

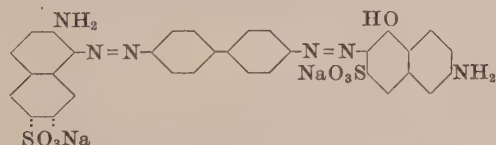
+ Acetic acid (dil.) — bluer;

+ NaOH — little change

22165 Direct Dye

Benzidine \swarrow (2) Broenner's acid
 \searrow (1) Salicylic acid

FIAT 764 — Benzoorange R (minor component)

22170 C.I. Direct Red 74 (Bluish red)

Benzidine \swarrow 6(and 7)-Amino-2-naphthalenesulfonic acid
 \searrow (alk.) J acid

Badische Co., *FP* 227892; *GP* 93276 (*Fr.* 4, 860)

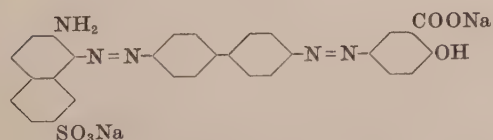
FIAT 764 — Oxaminbordo BXX

Soluble in water (bordeaux), moderately soluble in ethanol (red)

H_2SO_4 conc. — blue; on dilution — corinth

Aqueous solution + HCl conc. — corinth, ppt;

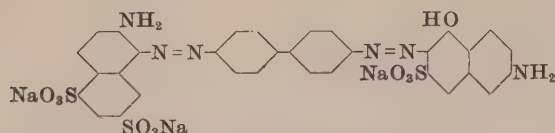
+ NaOH conc. — orange brown

22175 Direct Dye

Benzidine \swarrow (2) 7-Amino-2-naphthalenesulfonic acid
 \searrow (1) Salicylic acid

Chlorazol Orange 2R (H)

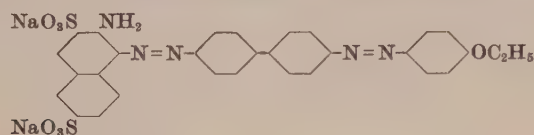
Dyes cotton or chrome mordanted wool bright orange

22180 C.I. Direct Red 42 (Dull bluish red)

Benzidine \nearrow (1) 6-Amino-1,3-naphthalenedisulfonic acid
 \searrow (2) (alk.) J acid

Discoverers — A. Bernthsen and P. Julius 1893
 Badische Co., BP 2614/93; USP 521096; FP 227892; GP 75469
 (Fr. 3, 690), GP 93276 (Fr. 4, 860)
 BIOS 1548, 167
 FIAT 764 — Benzorubin HW

Soluble in water (magenta red)
 Slightly soluble in ethanol (pale pink)
 H₂SO₄ conc. — blue; on dilution — pale reddish brown
 Aqueous solution + HCl conc. — reddish brown, ppt;
 + NaOH conc. — orange brown

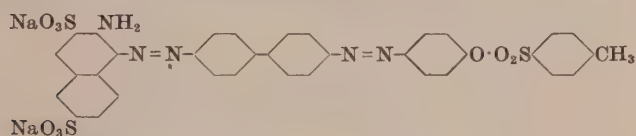
22190 C.I. Direct Orange 101 (Bright orange)

Benzidine \nearrow 3-Amino-2,7-naphthalenedisulfonic acid
 \searrow Phenol;

then ethylate by heating under pressure with ethyl chloride in aqueous caustic soda solution

Discoverer — O. Borgmann 1889
 Agfa, BP 17957/89; USP 454840; FP 160722; GP 52328
 (Fr. 2, 356)
 FIAT 764 — Congoorange G

Moderately soluble in water and ethanol (golden orange)
 Very soluble in Cellosolve; insoluble in other organic solvents
 H₂SO₄ conc. — dark blue; on dilution — pale brownish yellow, ppt.
 HNO₃ conc. — orange solution
 Aqueous solution + HCl conc. — yellowish olive brown ppt;
 + NaOH conc. — golden orange, ppt.

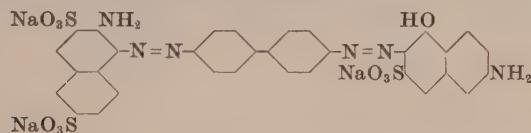
22195 C.I. Acid Orange 45 (Reddish orange)

Benzidine \nearrow 3-Amino-2,7-naphthalenedisulfonic acid
 \searrow Phenol;

then esterify the hydroxy group with p-toluenesulfonyl chloride

Discoverer — Richard (Geigy Co.)

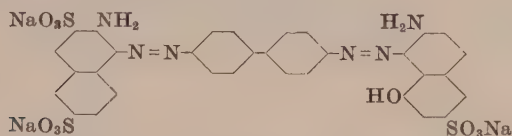
Soluble in water (yellow)
 H₂SO₄ conc. — orange; on dilution — no change
 Aqueous solution + HCl conc. — pinker;
 + HNO₃ conc. — pinker;
 + NaOH dil. — considerably weaker

22200 C.I. Direct Red 60 (Bluish red)

Benzidine \nearrow (1) 3-Amino-2,7-naphthalenedisulfonic acid
 \searrow (2) (alk.) J acid

Discoverers — A. Bernthsen and P. Julius 1893
 Badische Co., BP 2614/93; USP 555359; FP 227892; GP 93276
 (Fr. 4, 860)
 FIAT 764 — Oxaminrot 3B

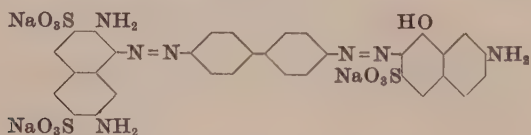
Soluble in water (wine red) and ethanol (reddish orange)
 H₂SO₄ conc. — dark blue (+ violet and magenta red); on dilution — reddish brown
 Aqueous solution + HCl conc. — reddish brown, ppt;
 + NaOH conc. — reddish orange brown

22205 C.I. Direct Red 43 (Bordeaux)

Benzidine \nearrow 3-Amino-2,7-naphthalenedisulfonic acid
 \searrow (acid) Gamma acid

Discoverer — H. Witter 1906
 Bayer Co., USP 842048; FP 370265; GP 190694 (Fr. 9, 366)
 FIAT 764 — Diaminbrillantbordo R

Soluble in water (red)
 Slightly soluble in ethanol (pink)
 H₂SO₄ conc. — blue; on dilution — dullish blue
 Aqueous solution + HCl conc. — dull violet to dark blue, ppt;
 + NaOH conc. — reddish orange

22210 Direct Dye

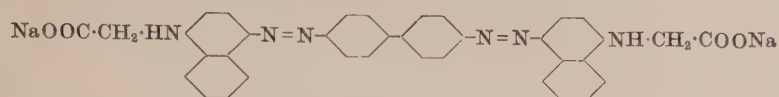
Benzidine \nearrow (1) 3,6-Diamino-2,7-naphthalenedisulfonic acid
 \searrow (2) (alk.) Gamma acid

Note — In Zambesi Brown GG (A) the first coupling component was 3,6-diamino-2-naphthalenesulfonic acid

Discoverers — Prinz and Herzberg 1893

Zambesi Brown GG (A)
 Hue, direct, violet; developed with toluene-2,4-diamine, catch-brown
 Fastness Properties: Acid and alkali, good; Light, good; Washing, moderate
 Agfa, BP 3844/94; GP 80070 (Fr. 4, 949)

Soluble in water (bordeaux red — G, reddish violet — GG) and in ethanol (brown — G, violet — GG)
 H₂SO₄ conc. — blue; on dilution — reddish brown ppt — G, reddish violet ppt. — GG
 Aqueous solution + HCl — reddish brown ppt — G, reddish violet ppt — GG;
 + NaOH — reddish brown solution — G, reddish violet solution — GG

22220 Direct Dye

Benzidine \rightleftharpoons *N*-1-Naphthylglycine (2 mol.)

Discoverer — Kinzlberger & Co. 1891

Glycine Corinth (Ki)

Formerly used as a photographic sensitiser
BP 21949/91; USP 498303; GP 74775 (*Fr.* 3, 707)

Soluble in water (bluish red) and ethanol (red)
H₂SO₄ conc. — blue; on dilution — violet ppt.
Aqueous solution + HCl — violet ppt;
+ NaOH — red ppt.

22230 Direct Dye

Benzidine \rightleftharpoons (2) Phenol
(1) (acid) H acid

Aqueous solution + HCl conc. — dark greyish violet, ppt;
+ NaOH conc. — dark greyish violet

Discoverer — Bayer Co.

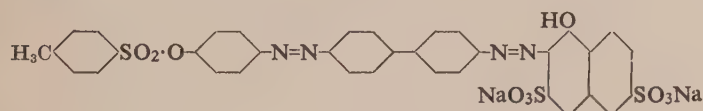
Para Green BBL (By)

Fastness Properties (C), coupled with diazotised *p*-nitro-aniline: Acid (organic) 3, Alkali 5, Light 3, Washing 2-3, Water 3-4
Dischargeability, good

Soluble in water (greyish blue)

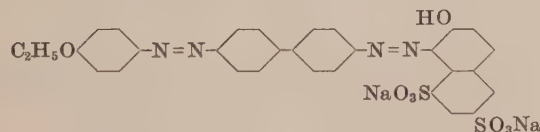
Slightly soluble in ethanol

H₂SO₄ conc. — dark navy blue; on dilution — bright greyish violet

22238 C.I. Acid Red 323 (Bright red)

Benzidine \rightleftharpoons 1-Naphthol-3,6-disulfonic acid
Phenol

then esterify with *p*-toluenesulfonyl chloride

22240 C.I. Direct Red 37 (Red)

Benzidine \rightleftharpoons (2) Phenol;
(1) G acid

then ethylate the phenol hydroxy group by heating under pressure with ethyl chloride in aqueous ethanol solution in the presence of sodium carbonate

Discoverer — A. Weinberg 1889

Cassella Co., BP 12560/89; USP 426345; FP 200152; GP 54084 (*Fr.* 2, 384)

FIAT 764 — Diaminscharlach B
JSDC, 10 (1894), 186

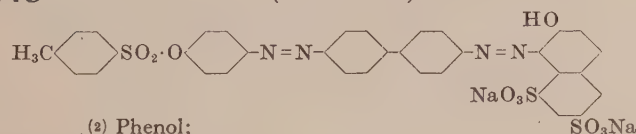
Soluble in water (red)

Slightly soluble in ethanol, acetone and Cellosolve; insoluble in other organic solvents

H₂SO₄ conc. — deep violet; on dilution — brown ppt.

HNO₃ conc. — bright red solution

Aqueous solution + HCl conc. — orange brown ppt;
+ NaOH conc. — reddish orange, ppt.

22245 C.I. Acid Red 85 (Yellowish red)

Benzidine \rightleftharpoons (2) Phenol;
(1) G acid

then esterify the phenol hydroxy group with *p*-toluenesulfonyl chloride

There are closely related dyes in which benzidine may be replaced by tolidine and other esterifying agents may be used. See C.I.23635 and C.I.24125

Geigy Co., BP 25866/12; USP 1067881; FP 450866; GP 261047 (*Fr.* 11, 389)

FIAT 764 — Supranolscharlach GN

Moderately soluble in water (red) and ethanol (orange)

H₂SO₄ conc. — violet; on dilution — orange brown

Aqueous solution + HCl conc. — wine red, ppt;
+ NaOH conc. — orange brown

22250 C.I. Direct Yellow 1 (Dull yellow)

Benzidine \rightleftharpoons Salicylic acid (2 mol.)

H₂SO₄ conc. — magenta red; on dilution — pale olive yellow

Aqueous solution + HCl conc. — pale yellowish olive;

+ NaOH conc. — orange

Discoverer — E. Frank 1884

Bayer Co., BP 9162/84, 9606/84; USP 329638-9, 401024; FP 162880; GP 31658 (*Fr.* 1, 465)

Sunbeam Chem. Co., USP 1361811

Knecht, JSDC, 1 (1885), 267; 2 (1886), 2

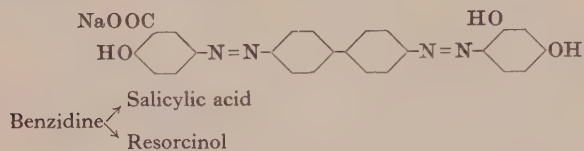
Lepetit & Levi, Gazz. 41 (1911), 675

Sircar & Watson, JSCI, 31 (1912), 31

Seyewetz & Chaix, Bull. Soc. chim. 41 (1927), 332

Soluble in water (lemon yellow)

Slightly soluble in ethanol

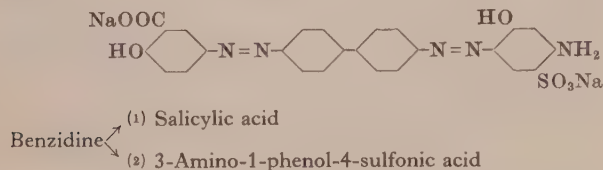
22255 Acid Dye

Discoverers — E. Frank and C. Duisberg; G. Schultz 1887

Cloth Orange (By)

Bayer Co., BP 2213/86, 6687/87; FP 195132; GP 44797, 52183 (Fr. 2, 349, 352)

Knecht, JSDC, 5 (1889), 170

Soluble in water and ethanol (yellowish brown)
 H_2SO_4 conc. — reddish violet; on dilution — brown ppt.
 Aqueous solution + HCl conc. — brown, ppt;
 + NaOH conc. — red, ppt.**22260 Direct Dye (Reddish orange)**

Discoverer — Bayer Co. 1894

Brilliant Direct Orange G (By)

Fastness Properties (C): Acid (organic) 3, Alkali 2, Light 1, 2, 3, Washing 2, Water 2-3

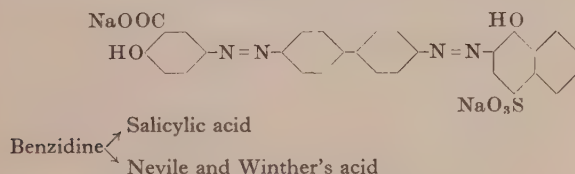
Dischargeability: neutral, good-very good; alkaline, fairly good-good

GP 78625 (Fr. 4, 924)

FIAT 764 — Brillantdirektorange G

JSDC, 11 (1895), 76

Schultz, Ber. 39 (1906), 3347

Soluble in water (brownish orange) and ethanol (golden yellow)
 H_2SO_4 conc. — reddish violet; on dilution — brownish orange
 HNO_3 conc. — bluish red
 Aqueous solution + HCl conc. — brown ppt;
 + NaOH conc. — orange**22270 Mordant Dye**

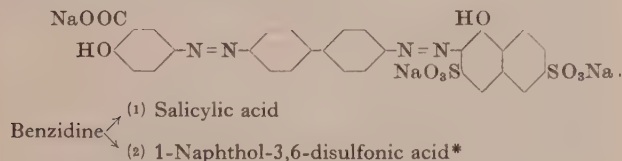
Discoverers — E. Frank and C. Duisberg; G. Schultz 1887

Cloth Brown R (By)

Dyes mordanted wool brownish red

Bayer Co., BP 2213/86, 6687/87; FP 195132; GP 44797, 52183 (Fr. 2, 349, 352)

Knecht, JSDC, 5 (1889), 170

Soluble in water (reddish brown); insoluble in ethanol
 H_2SO_4 conc. — bluish violet; on dilution — reddish brown ppt.
 Aqueous solution + HCl conc. — reddish brown ppt;
 + NaOH conc. — faint brown ppt.**22275 Mordant Dye (Bright red)**

* or 1-Naphthol-3,6 (and 3,7)-disulfonic acid

Aqueous solution + HCl conc. — reddish brown, ppt;
 + NaOH conc. — orange brown

Discoverers — C. Schraube and W. Voigtländer — Tetzner 1901

Palatine Chrome Red RX (B)

Afterchrome dye

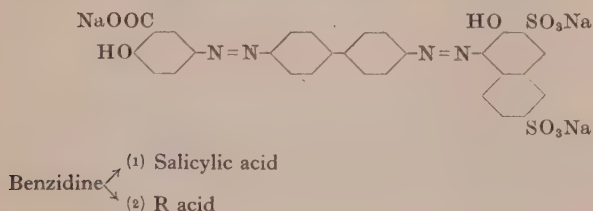
Fastness Properties (DEK): Levelling 3, Light 4, Rubbing 3, Stoving 2, Peroxide 2, Alkaline Milling 4, Carbonising 3.
 Affected by iron

Chiefly used for oriental carpet yarns

Ref. I.G., Wool Man. 66, 845

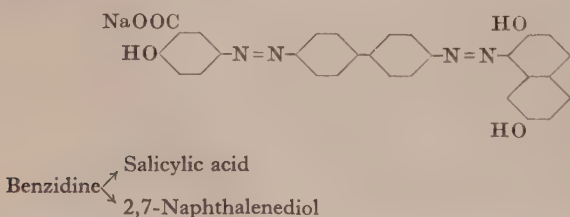
Badische Co., BP 6643/01; USP 713507; FP 309573; GP 143897 (Fr. 7, 408)

FIAT 764 — Palatinchromrot RX

Soluble in water (magenta red)
 Slightly soluble in ethanol (brownish orange)
 H_2SO_4 conc. — deep violet; on dilution — pale reddish brown**22280 C.I. Direct Red 18 (Bluish red \rightarrow Bordeaux)**

Discoverers — C. Duisberg and G. Schultz 1887

Bayer Co., BP 2213/86; USP 447303; GP 44797, 52183 (Fr. 2, 349, 352)

Slightly soluble in water (salmon red)
 H_2SO_4 conc. — reddish violet; on dilution — orange red
 Aqueous solution + HCl — brownish red ppt;
 + NaOH — yellow ppt.**22285 Acid Dye**

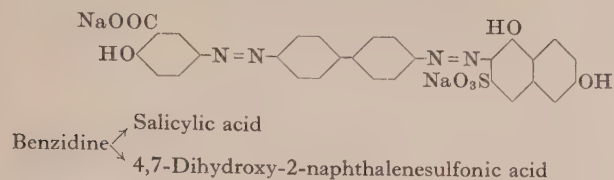
Discoverers — E. Frank and C. Duisberg 1887

Cloth Brown G (By)

Bayer Co., BP 6687/87; FP 195132; GP 44797, 52183 (Fr. 2, 349, 352)

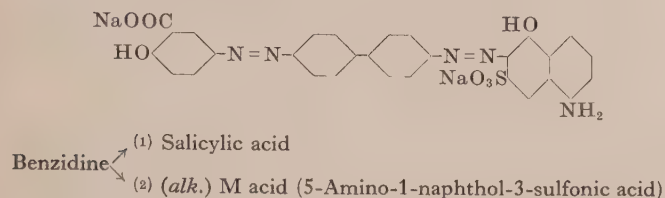
Knecht, JSDC, 5 (1889), 170

Soluble in water (brown)
 Slightly soluble in ethanol
 H_2SO_4 conc. — reddish violet; on dilution — brown ppt.
 Aqueous solution + HCl conc. — brown ppt;
 + NaOH conc. — reddish brown

22290 C.I. Direct Red 52 (Bluish red)

Discoverer — M. Kähn (Bayer Co.) 1902
 FIAT 764 — Benzoechtrot GL

Soluble in water (red); moderately soluble in ethanol (brownish to reddish orange)
 H_2SO_4 conc. — dark blue; on dilution — pale reddish brown
 Aqueous solution + HCl conc. — brown, ppt;
 + NaOH conc. — red ppt.

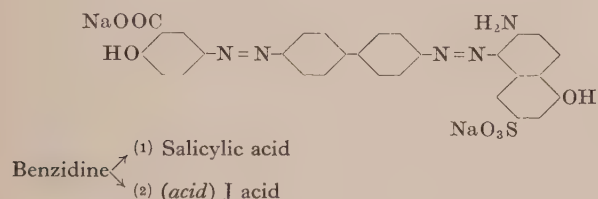
22300 Direct Dye

Discoverers — A. Bernthsen and P. Julius 1893

Oxamine Maroon (B)

Fastness Properties (C): Acid (organic) 3-4, Alkali 4, Light 3, Washing 2, Water 1
 Badische Co., BP 2370/93; USP 558344; FP 229263; GP 82572 (Fr. 4, 859)
 FIAT 764 — Oxaminmarron

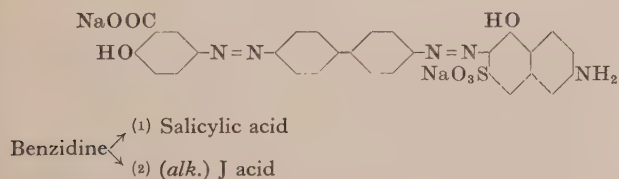
Moderately soluble in water (corinth); soluble in ethanol (reddish brown)
 H_2SO_4 conc. — violet; on dilution — pale brown
 Aqueous solution + HCl conc. — corinth, ppt;
 + NaOH conc. — orange to reddish brown

22305 C.I. Direct Red 29 (Bordeaux)

Discoverers — A. Bernthsen and P. Julius 1893

Badische Co., BP 2614/93; USP 555359; FP 227892; GP 93276 (Fr. 4, 860)
 JSDC, 12 (1896), 134
 FIAT 764 — Oxaminrot (X)

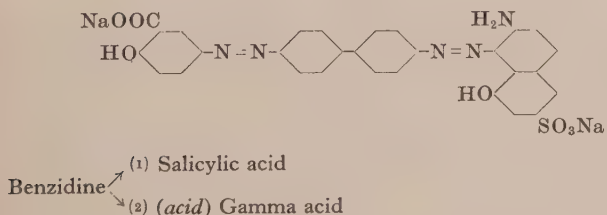
Soluble in water (red) and ethanol (orange)
 H_2SO_4 conc. — violet; on dilution — brown, ppt.
 Aqueous solution + HCl conc. — reddish brown, ppt;
 + NaOH conc. — orange to reddish brown

22306 C.I. Direct Red 33 (Bordeaux)

Discoverer — L. Gans 1889

Cassella Co., BP 16699/89; FP 201770; GP 55648 (Fr. 2, 397), GP 57857 (Fr. 5, 955)
 FIAT 764 — Diaminechtrot F
 JSDC, 9 (1893), 159

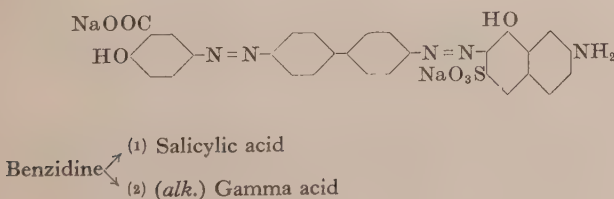
Soluble in water (yellowish red)
 Slightly soluble in ethanol, acetone and Cellosolve; insoluble in other organic solvents
 H_2SO_4 conc. — dark blue; on dilution — redder (pale corinth), ppt.
 HNO_3 conc. — reddish brown
 Aqueous solution + HCl conc. — reddish brown, ppt;
 + NaOH conc. — orange brown

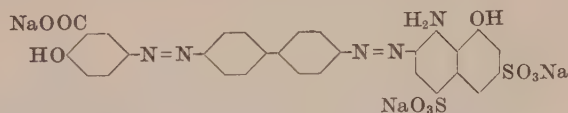
22310 C.I. Direct Red 1 (Bluish red)

Discoverer — L. Gans 1889

Cassella Co., BP 16699/89; FP 201770; GP 57857 (Fr. 5, 955)
 BIOS 1548, 188
 FIAT 764 — Diaminbraun M

Soluble in water (deep reddish brown), ethanol (brownish red) and Cellosolve (reddish brown)
 Slightly soluble in acetone; insoluble in other organic solvents
 H_2SO_4 conc. — violet; on dilution — pale reddish brown, ppt.
 HNO_3 conc. — orange brown
 Aqueous solution + HCl conc. — dark brown;
 + NaOH conc. — orange brown

22311 C.I. Direct Brown 2 (Reddish brown)

22315 C.I. Direct Green 60 (Dull yellowish green)*

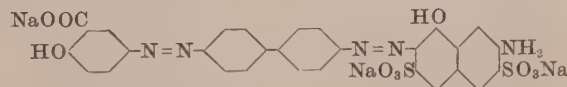
Benzidine \swarrow (1) Salicylic acid
 \searrow (2) (acid) K acid

* Coupled with diazotised *p*-nitroaniline

Discoverer — Cassella Co. 1907

Cassella Co., *FP* 394491; *GP* 204707, 216638, (*Fr.* 9, 375, 376)
 Bayer Co., *BP* 11355/09

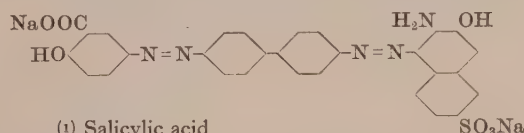
Soluble in water (reddish brown); insoluble in ethanol
 H_2SO_4 conc. — navy blue; on dilution — pale bluish grey
 Aqueous solution + HCl conc. — dull bluish green, ppt;
 + NaOH conc. — bordeaux, ppt.

22320 Direct Dye

Benzidine \swarrow (1) Salicylic acid
 \searrow (2) (alk.) 2R acid

Diazol Brown MS (Fran)

For dyeing silk, wool, leather and for burl dyeing of vegetable fibres at low temperatures. Good dischargeability

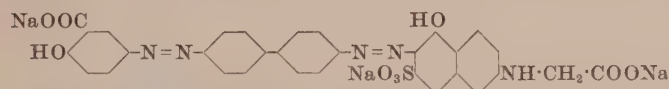
22322 C.I. Direct Green 21:1 See page 4224**22325 C.I. Direct Brown 60 (Yellowish brown)**

Benzidine \swarrow (1) Salicylic acid
 \searrow (2) (acetic acid) 3-Amino-2-naphthol-7-sulfonic acid

Discoverers — A. Blank, W. A. Israel and M. Kahn (Bayer Co) 1898

FIAT 764 — Benzochrombraun 5G

Moderately soluble in water (yellowish brown)
 Slightly soluble in ethanol (brownish yellow to olive)
 H_2SO_4 conc. — bluish black; on dilution — pale yellowish brown
 Aqueous solution + HCl conc. — olive brown, ppt;
 + NaOH conc. — orange brown

22330 Direct Dye

Benzidine \swarrow (1) Salicylic acid
 \searrow (2) (alk.) *N*-Carboxymethyl J acid

Discoverer — A. L. Laska 1902

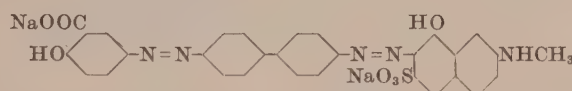
Triazol Red 6B (By)

Fastness Properties (C): Acid (organic) 3, Alkali 4, Hot Pressing 4, Light 3, Washing 2, Water 2-3

Oehler, *BP* 5792/03; *USP* 724893-4, 728477; *GP* 152679 (*Fr.* 7, 428)

Soluble in water (red)
 Moderately soluble in ethanol (orange brown)
 H_2SO_4 conc. — dark blue (+ little greenish blue); on dilution — orange brown

Aqueous solution + HCl conc. — orange brown, ppt;
 + NaOH conc. — reddish orange brown

22335 Direct Dye

Benzidine \swarrow (1) Salicylic acid
 \searrow (2) (alk.) *N*-Methyl Gamma acid

Discoverer — C. Ris 1895

Diphenyl Brown RN (Gy)

Fastness Properties: Acid and Alkali, good. Light and Washing, moderate but improved by aftertreatment with dichromate and copper sulfate

Geigy Co., *BP* 2771/96; *USP* 567413; *FP* 250697; *GP* 103149 (*Fr.* 5, 576)

Soluble in water (dark reddish brown) and ethanol (reddish brown)
 H_2SO_4 conc. — bluish violet; on dilution — brownish red ppt.
 Aqueous solution + HCl — brownish red ppt;
 + NaOH — brownish red

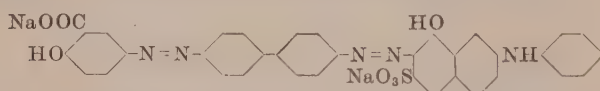
22340 C.I. Direct Brown 58 (Brown)

Benzidine \swarrow (1) Salicylic acid
 \searrow (2) (alk.) *N,N*-Dimethyl Gamma acid

Discoverer — C. Ris 1895

Geigy Co., *BP* 2771/96; *USP* 567413; *FP* 250697; *GP* 103149 (*Fr.* 5, 576)

Soluble in water (dark brown) and ethanol (dull orange brown)
 H_2SO_4 conc. — dull bluish violet; on dilution — bordeaux (red brown, ppt.)
 Aqueous solution + H_2SO_4 10% — dull bluish red;
 + NaOH conc. — reddish orange brown

22345 C.I. Direct Brown 59 (Blackish brown)

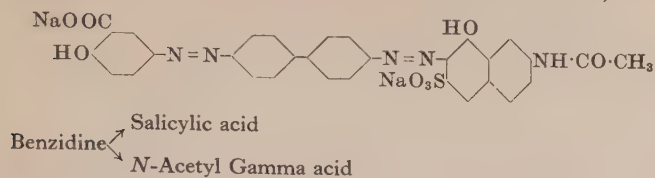
Benzidine \swarrow (1) Salicylic acid
 \searrow (2) (alk.) *N*-Phenyl Gamma acid

Discoverer — A. Weinberg 1894

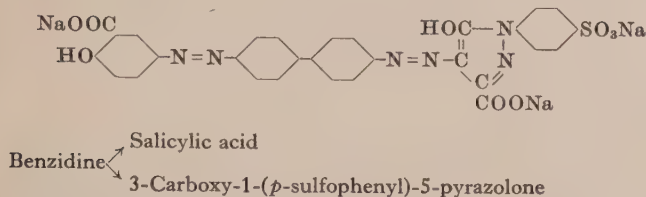
Cassella Co., *BP* 11157/94; *USP* 535036, 537511; *FP* 239509; *GP* 79014, 80417, 84859, (*Fr.* 4, 569, 571, 868)

FIAT 764 — Diaminbraun B, BD
JSDC, 10 (1894), 187

Soluble in water (olive brown) and ethanol (reddish brown)
 Slightly soluble in acetone
 H_2SO_4 conc. — violet; on dilution — pale reddish brown
 HNO_3 conc. — reddish brown becoming olive brown
 Aqueous solution + HCl conc. — dark brown ppt;
 + NaOH conc. — reddish brown ppt.

22360 C.I. Direct Red 88 (*Dull bluish red* → *Bordeaux*)

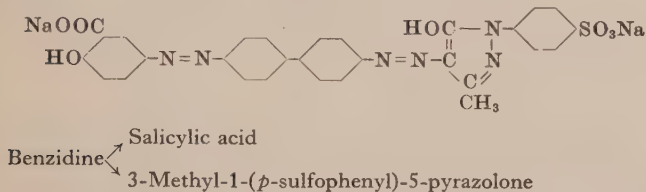
Soluble in water (cerise red)
H₂SO₄ conc. — dark reddish violet; on dilution — brown
Aqueous solution + HCl — brownish violet ppt;
+ NaOH — reddish brown, brick red ppt.

22370 C.I. Direct Orange 1 (*Yellowish orange*)

Discoverer — M. Böniger 1909

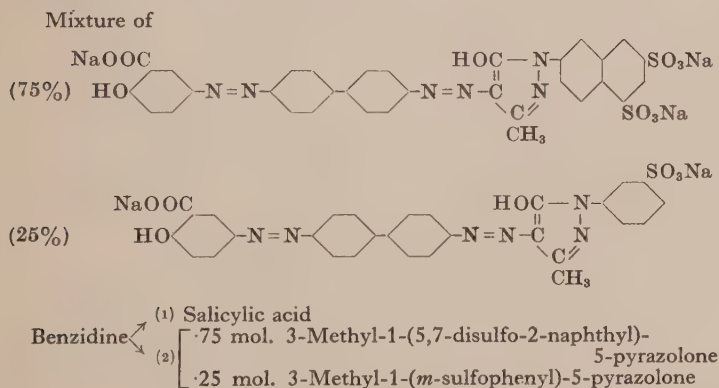
Sandoz, BP 20649/09, 20650/09; USP 959109; FP 405987;
GP 219498, 222061, (Fr. 10, 874, 875)
Mayer, *Chim. et Ind.* 2 (1919), 786

Soluble in water (orange)
Slightly soluble in ethanol (bright yellow), acetone and Cellosolve;
insoluble in other organic solvents
H₂SO₄ conc. — bluish red to violet; on dilution — reddish yellow
(dark brown ppt.)
Aqueous solution + NaOH conc. — scarlet

22375 C.I. Direct Orange 1 (*Yellowish orange*)

Discoverer — M. Böniger 1909

Sandoz, BP 20649/09, 20650/09; USP 959109; FP 405987;
GP 219498, 222061, (Fr. 10, 874, 875)

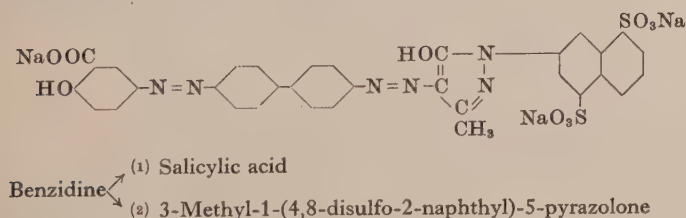
22380 C.I. Direct Orange 2 (*Orange*)

Discoverer — P. Volkmann 1907

Bayer Co., BP 11866/08; USP 902186; FP 391456; GP 221696
(Fr. 9, 1185)

BIOS 1548, 150 Benzo Fast Orange G

Soluble in water (golden orange)
Moderately soluble in ethanol (golden yellow)
H₂SO₄ conc. — reddish violet + blue; on dilution — golden yellow
Aqueous solution + HCl conc. — yellowish olive, ppt;
+ NaOH conc. — orange

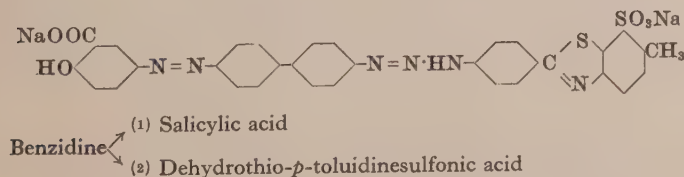
22385 C.I. Direct Orange 33 (*Yellowish orange*)

Discoverer — P. Volkmann 1907

Bayer Co., BP 11866/08; USP 902186; FP 391456; GP 221696
(Fr. 9, 1185)

FIAT 764 — Toluylenechtorange GL

Soluble in water (golden yellow)
Very slightly soluble in ethanol
H₂SO₄ conc. — magenta red (+ dark violet); on dilution — turquoise blue
Aqueous solution + HCl conc. — brownish olive yellow, ppt;
+ NaOH conc. — orange brown

22390 Direct Dye

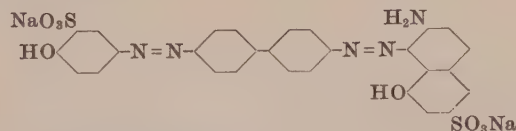
Discoverer — Dahl Co. 1889

Alkali Yellow R (WDC)

Fastness Properties: Acid, good; Alkali, poor; Light and Washing, moderate

FP 195881; GP 57095 (Fr. 3, 749)
JSDC, 15 (1899), 20

Soluble in water (opalescent yellow)
H₂SO₄ conc. — brownish red
Aqueous solution + HCl — brownish yellow, ppt;
+ NaOH — orange red, ppt.

22400 Acid Dye

Benzidine \rightarrow 1-Phenol-2-sulfonic acid
(acid) Gamma acid

Discoverer — Badische Co. 1901

Wool Red G (B)

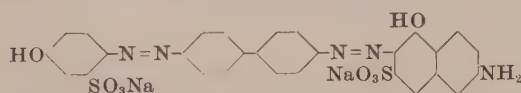
FP 313533; GP ap. B29549 (Fr. 6, 876)

Soluble in water (red)

H₂SO₄ conc. — violet solution; on dilution — brown ppt.

Aqueous solution + HCl — brown ppt.

+ NaOH — dark red

22405 C.I. Direct Red 53 (Bright bluish red)

Benzidine \rightarrow 1-Phenol-3-sulfonic acid
(alk.) J acid

Discoverer — Badische Co. 1912

BP 25906/12; FP 450713; GP 264938 (Fr. 11, 419)

FIAT 764 — Oxaminbrillantrot B

Schultz & Ichenhäuser, *J. prakt. Chem.* 77 [2] (1908), 117 —
Coupling of 1-phenol-3-sulfonic acid

Soluble in water (red)

Moderately soluble in ethanol

H₂SO₄ conc. — deep violet to blue; on dilution — corinth

Aqueous solution + HCl conc. — reddish violet, ppt;

+ NaOH conc. — scarlet, ppt.

22410 C.I. Direct Yellow 20 (Yellow)

Benzidine \rightarrow 2,3-Cresotic acid (2 mol.)

Discoverers — C. Rudolph and B. Priebis 1888

Oehler, BP 7997/88; USP 396294; GP 47235 (Fr. 2, 353)

Bayer Co., USP 394841

Soluble in water (yellow)

Slightly soluble in benzene, carbon tetrachloride, Cellosolve and Stoddard solvent

H₂SO₄ conc. — reddish violet; on dilution — bluish violet, later greenish yellow ppt.

HNO₃ conc. — partial solution, reddish violet, turns brown

Aqueous solution + HCl conc. — brownish yellow, ppt;
+ NaOH conc. — reddish yellow, ppt.

22415 Direct Dye (Bluish red)

Benzidine \rightarrow (1) 2,3-Cresotic acid
(2) (alk.) J acid

Discoverers — A. Bernthsen and P. Julius 1893

Oxamine Red BN (B)

Fastness Properties (C): Acid (organic) 3, Alkali 4, Light 2,
Washing 1-2, Water 1

Dischargeability: neutral, fairly good; alkaline, good

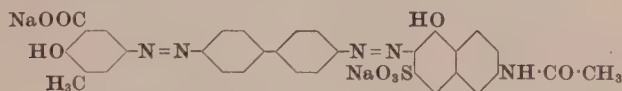
Badische Co., BP 2614/93; USP 585359; FP 227892; GP 93276
(Fr. 4, 860)

Soluble in water (red) and ethanol (orange)

H₂SO₄ conc. — violet; on dilution — brown

Aqueous solution + HCl conc. — reddish brown, ppt;

+ NaOH conc. — red, ppt.

22420 C.I. Direct Red 59 (Bluish red)

Benzidine \rightarrow (1) 2,3-Cresotic acid
(2) N-Acetyl J acid

Discoverer — J. Herbabny 1900

Oehler, BP 10277/00, 14725/00; USP 666867; GP 127140
(Fr. 6, 972)

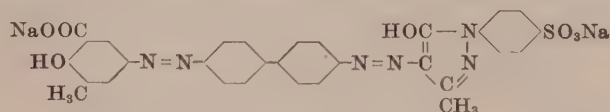
FIAT 764 — Benzoechtrot BB

Soluble in water (reddish orange brown) and ethanol (red)

H₂SO₄ conc. — dark blue; on dilution — reddish brown

Aqueous solution + HCl conc. — reddish brown, ppt;

+ NaOH conc. — orange brown, ppt.

22430 C.I. Direct Orange 1 (Orange)

Benzidine \rightarrow 2,3-Cresotic acid
3-Methyl-1-(p-sulphophenyl)-5-pyrazolone

Discoverer — M. Böniger 1909

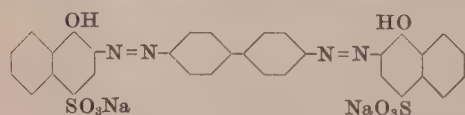
Sandoz, BP 20649/09, 20650/09; USP 959109; FP 405987;
GP 219498, 222061, (Fr. 10, 874, 875)

Soluble in water (orange)

Slightly soluble in ethanol

H₂SO₄ conc. — reddish violet; on dilution — brownish orange

Aqueous solution + NaOH — reddish orange

22440 C.I. Direct Violet 43 (Reddish violet)

Benzidine \rightarrow Neville and Winther's acid (2 mol.)

Ver. Chem. Fab. Mannheim, BP 2237/83; GP 26012 (Fr. 1, 391)

Soluble in water (bordeaux)

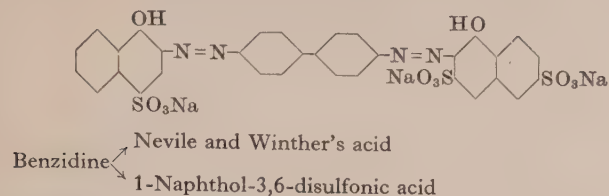
Insoluble in ethanol

H₂SO₄ conc. — dark blue; on dilution — reddish violet

Aqueous solution + NaOH conc. — bluish red

22445 C.I. Direct Violet 3 (Violet)

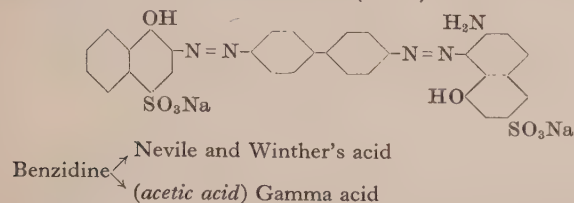
Discoverer — Bayer Co. 1895
FIAT 764 — Benzoviolett R



Soluble in water (deep violet)
 Slightly soluble in ethanol (reddish violet)
 Insoluble in acetone
 H_2SO_4 conc. — blue; on dilution — reddish violet
 Aqueous solution + HCl conc. — bordeaux;
 + NaOH conc. — red

22450 C.I. Direct Violet 42 (Violet)

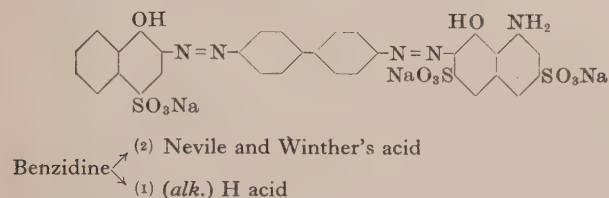
Discoverer — Cassella Co. 1889
GP 57857 (*Fr.* 5, 955)
FIAT 764 — Oxydiaminviolett B



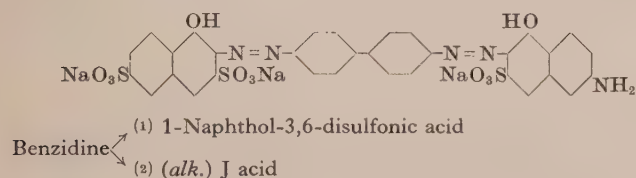
Soluble in water (reddish violet) and ethanol
 H_2SO_4 conc. — deep blue; on dilution — corinth
 Aqueous solution + HCl conc. — dullish violet;
 + NaOH conc. — wine red

22455 C.I. Direct Blue 230 (Blue)

Cassella Co., *BP* 1742/91; *USP* 464135; *EP* 201770; *GP* 74593
 (*Fr.* 3, 684)

**22460 C.I. Direct Violet 27 (Violet)**

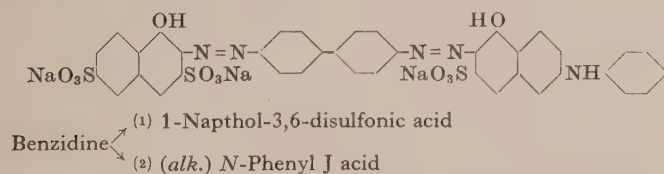
Discoverer — Cassella Co. 1893
 Badische Co., *BP* 2614/93; *USP* 521096; *FP* 227892; *GP* 75469
 (*Fr.* 3, 690), *GP* 93276 (*Fr.* 4, 860)
FIAT 764 — Diaminheliotrop B



Soluble in water (reddish violet)
 Moderately soluble in ethanol (magenta red)
 H_2SO_4 conc. — deep blue; on dilution — bordeaux
 Aqueous solution + HCl conc. — bordeaux, ppt;
 + NaOH conc. — wine red

22465 C.I. Direct Violet 17 (Dull bluish violet)

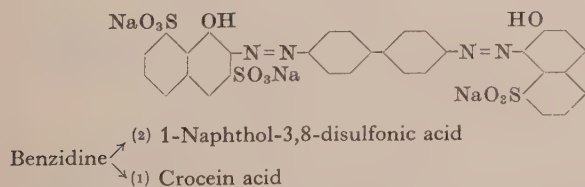
Discoverer — Oehler Co.
 Dyes of similar constitution —
 Griesheim-Elektron, *USP* 860220-1; *GP* 196924, 200054, (*Fr.* 9,
 377, 378)
FIAT 764 — Triazolviolett BN



Soluble in water (bordeaux)
 Moderately soluble in ethanol (pink)
 H_2SO_4 conc. — blue; on dilution — dullish violet
 Aqueous solution + HCl conc. — corinth, ppt;
 + NaOH conc. — reddish brown

22470 C.I. Direct Violet 36 (Bright violet)

Discoverer — M. Kahn 1892
 Agfa, *BP* 1346/88; *GP* 40954 (*Fr.* 1, 483), *GP* 43493, 45342,
 (*Fr.* 2, 388, 389)
FIAT 764 — Heliotrop BB

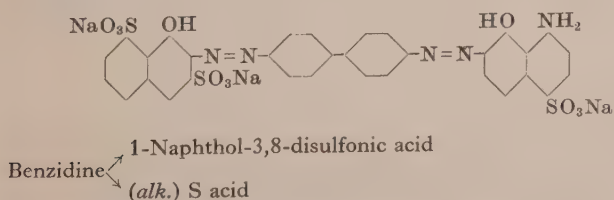


The first constitution given in C.I. 1st edition No. 386 was incorrect

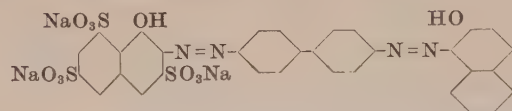
Soluble in water (reddish violet to rubine)
 Moderately soluble in ethanol
 H_2SO_4 conc. — blue; on dilution — pink
 Aqueous solution + HCl conc. — dark blue, ppt;
 + NaOH conc. — wine red, ppt.

22475 C.I. Direct Blue 16 (Dull reddish violet \rightarrow Reddish navy)

Discoverer — M. Möller 1894



Soluble in water (bluish violet); insoluble in ethanol
 H_2SO_4 conc. — blue; on dilution — violet ppt.
 Aqueous solution + HCl — blue ppt;
 + NaOH conc. — blue solution

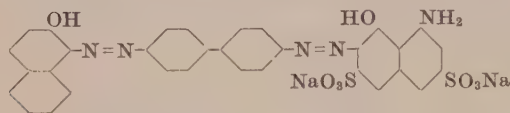
22480 C.I. Direct Violet 22 (Bluish violet)

Benzidine \rightarrow 1-Naphthol-3,6,8-trisulfonic acid
 2-Naphthol

Discoverer — M. Böniger 1896

Sandoz, BP 4703/97; USP 584981; FP 264279
King, JCS, (1932), 1268

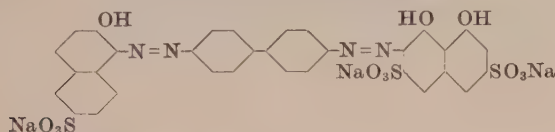
Soluble in water (violet)
 Slightly soluble in ethanol
 H_2SO_4 conc. — bright blue; on dilution — bright violet
 HNO_3 conc. — yellowish red
 Aqueous solution + NaOH 10% — very reddish violet

22485 C.I. Direct Blue 19 (Reddish blue \rightarrow Reddish navy)

Benzidine \rightarrow (2) 2-Naphthol
 (1) (alk.) H acid

22490 C.I. Direct Blue 58 (Dull reddish blue)

Discoverer — M.L.B. 1890



Benzidine \rightarrow (2) Schaeffer's acid
 (1) Chromotropic acid

Soluble in water (violet)
 H_2SO_4 conc. — blue; on dilution — violet solution, then reddish violet ppt.
 Aqueous solution + HCl — reddish violet ppt;
 + NaOH — red solution

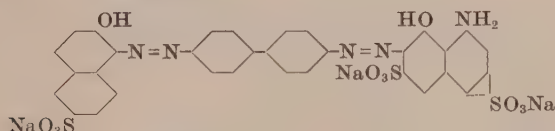
22495 Direct Dye

Discoverer — Kalle Co.

Naphthamine Blue 3R (K)

Cassella Co., GP ap. C3842

FIAT 764 — Naphtaminblau 3R



Benzidine \rightarrow (2) Schaeffer's acid
 (1) [0.6 mol. H acid]
 [0.4 mol. K acid]

Soluble in water (violet)
 Moderately soluble in ethanol (reddish violet)
 H_2SO_4 conc. — deep blue; on dilution — dullish reddish violet
 Aqueous solution + HCl conc. — reddish violet ppt;
 + NaOH conc. — bordeaux

22500 C.I. Direct Red 44 (Dull bluish red \rightarrow Reddish violet)

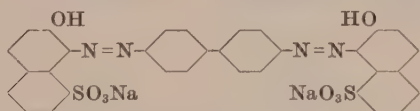
Discoverers — G. Schultz 1883; E. Frank 1884

Bayer Co., BP 1225/81, 8495/84; GP 30077 (Fr. 1, 371)

Schultz, Ber. 17 (1884), 462

King, JCS, (1932), 1273

Robinson & Moilliet, Pro. Roy. Soc. 143A (1934), 630

Benzidine \rightarrow Crocein acid (2 mol.)

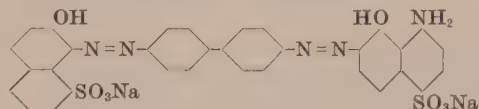
Soluble in water (magenta red to reddish violet)
 Slightly soluble in ethanol
 H_2SO_4 conc. — violet; on dilution — pale violet (redder)
 HNO_3 conc. — reddish orange solution
 Aqueous solution + HCl conc. — navy blue, ppt;
 + NaOH conc. — reddish brown, ppt.

22505 C.I. Direct Blue 42 (Reddish blue)

Discoverers — C. Ris and E. Haager 1907

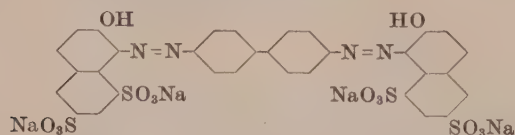
BP 27609/07; USP 888036; FP 383747; GP 203535, 209269,
(Fr. 9, 330, 331)

FIAT 764 — Benzoblau 4R

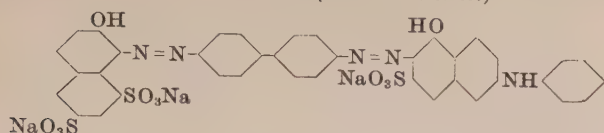


Benzidine \rightarrow Crocein acid
 (alk.) S acid

Soluble in water (violet blue) and in ethanol (reddish violet)
 H_2SO_4 conc. — blue; on dilution — violet ppt.
 Aqueous solution + HCl — blue;
 + NaOH — reddish violet

22510 C.I. Direct Violet 45 (Violet)Benzidine \rightarrow G acid (2 mol.)

Soluble in water
 H_2SO_4 conc. — violet; on dilution — rubine
 HNO_3 conc. — orange solution
 Aqueous solution + NaOH conc. — red

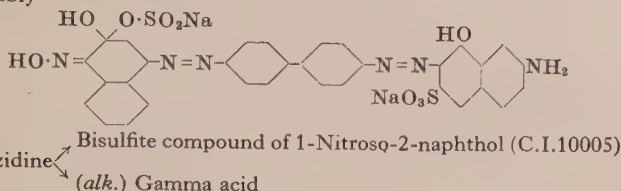
22520 C.I. Direct Violet 85 (Dull bluish violet)

Benzidine \rightarrow G acid
 \rightarrow N-Phenyl J acid

Soluble in water (dull violet), ethanol, and Cellosolve
 Insoluble in other organic solvents
 H_2SO_4 conc. — blue; on dilution — dull bluish violet, ppt.
 Aqueous solution + HCl 10% — pale dull violet;
 + NaOH 10% — slightly redder

22530 Direct Dye

Possibly



Benzidine \rightarrow Bisulfite compound of 1-Nitroso-2-naphthol (C.I.10005)
 (alk.) Gamma acid

H_2SO_4 conc. — blue; on dilution — brown ppt.
 Aqueous solution + HCl — bluer, brown ppt;
 + NaOH — brighter and yellower

Discoverer — E. Elsässer 1897

Alkali Dark Brown G, V (WDC)

Alkali Red Brown RR, 3R, T (WDC)

Fastness to alkali and washing improved by aftertreatment with copper sulfate

Dahl Co., USP 611111; GP 95758 (Fr. 5, 593)

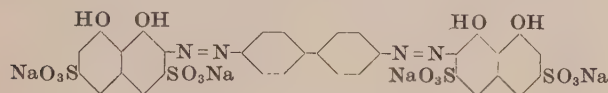
JSDC, 15 (1899), 20

Böniger, Ber. 27 (1894), 23

Woroshtzow & Bogdanow, Ber. 62B (1929), 68

Suter, The Organic Chemistry of Sulfur, Wiley & Sons (1944), 356-7

Soluble in water (violet red) and in ethanol (brownish red)

22540 C.I. Direct Blue 49 (Reddish blue \rightarrow Reddish navy)

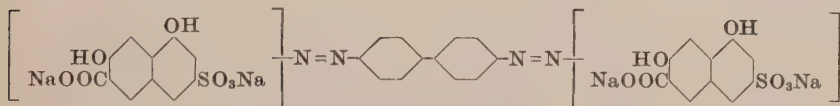
Benzidine \rightarrow Chromotropic acid (2 mol.)

Discoverer — H. Kuzel 1890

M.L.B., BP 9258/90, 5904/91; USP 458283; FP 212607; GP 69095 (Fr. 3, 588)

Soluble in water (deep violet); very slightly soluble in ethanol (violet)

H_2SO_4 conc. — greenish blue; on dilution — violet
 Aqueous solution + HCl conc. — deep bluish violet;
 + NaOH conc. — dullish violet

22545 Direct Dye

Benzidine \rightarrow 3,5-Dihydroxy-7-sulfo-2-naphthoic acid (2 mol.)

Discoverer — J. Schmid 1891

Direct Grey R (Ciba)

Ciba, BP 14161/92, 14233/92; USP 493562, 493564
 FP 219875, 220468; GP 67000, 75258 (Fr. 3, 505, 698)

Aqueous solution + HCl — dark bluish grey ppt;
 + NaOH conc. — (hot) dull violet red solution; (cold) dark reddish violet ppt.

Schmid, Ber. 26 (1893), 1120

Moderately soluble in water (violet); insoluble in ethanol
 H_2SO_4 conc. — blue; on dilution — bluish grey ppt.

22550 C.I. Direct Violet 12 (Violet)

Benzidine \rightarrow (alk.) J acid (2 mol.)

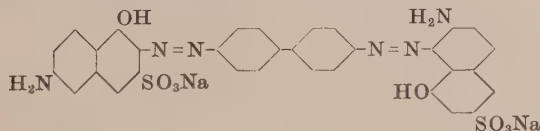
Discoverers — A. Bernthsen and P. Julius 1893

Badische Co., BP 2614/93; USP 521096; FP 227892; GP 75469 (Fr. 3, 690)

FIAT 764 — Oxaminviolett

Soluble in water (violet black) and ethanol (magenta red)

H_2SO_4 conc. — deep blue; on dilution — dullish violet
 Aqueous solution + HCl conc. — corinth to violet black, ppt;
 + NaOH conc. — violet black, ppt.

22555 C.I. Direct Violet 4 (Dull reddish violet)

Benzidine \rightarrow (2) (alk.) J acid
 \rightarrow (1) (acid) Gamma acid

Discoverers — M. Kahn, R. Kothe and W. A. Israel (Bayer Co.) 1899

BIOS 1548, 164

FIAT 764 — Benzoechtviolett R

Soluble in water (wine red)

Moderately soluble in ethanol (magenta red)
 H_2SO_4 conc. — dark blue (+ some magenta); on dilution — corinth

22565 C.I. Direct Blue 48 (Dull reddish blue \rightarrow Reddish navy)

Benzidine \rightarrow (alk.) J acid
 \rightarrow (alk.) H acid

Badische Co., GP 93276 (Fr. 4, 860)

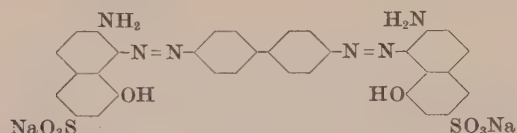
FIAT 764 — Benzomarinblau RM

Soluble in water

Slightly soluble in ethanol and acetone

H_2SO_4 conc. — blue

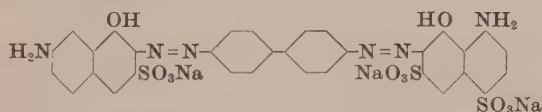
HNO_3 conc. — grey

22570 C.I. Direct Violet 1 (Violet)Benzidine \rightleftharpoons (acid) Gamma acid (2 mol.)

Discoverer — L. Gans 1889

Cassella Co., BP 16699/89; FP 201770; GP 55648 (Fr. 2, 397)
FIAT 764 — Benzoechtviolett NC, Diaminviolett NSoluble in water (dark bordeaux to violet) and Cellosolve
Slightly soluble in ethanol (reddish violet)
Insoluble in organic solvents
 H_2SO_4 conc. — deep blue; on dilution — dullish violet
 HNO_3 conc. — reddish brown
Aqueous solution + HCl conc. — violet, ppt;
+ NaOH conc. — corinth, ppt.**22580 C.I. Direct Black 29 (Bluish grey)**Benzidine \rightleftharpoons (alk.) Gamma acid (2 mol.)

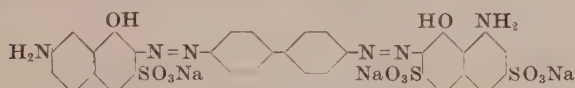
Discoverers — L. Gans 1889; Pfizinger 1890

Cassella Co., BP 16699/89, 8530/90; USP 501160; FP 201770;
GP 53799, 55648 (Fr. 2, 397-8)Soluble in water (violet black) and Cellosolve
Slightly soluble in ethanol (pale violet)
Insoluble in other organic solvents
 H_2SO_4 conc. — blue; on dilution — violet, ppt.
Aqueous solution + HCl conc. — dark blue, ppt;
+ NaOH conc. — bordeaux, ppt.**22585 Direct Dye**Benzidine \rightleftharpoons (alk.) Gamma acid
(alk.) K acid

Discoverers — J. Rosenberg and F. Krecke 1893

Naphthamine Black RE (K)**Naphthylamine Diazo Black (K)**

Developed with 2-naphthol (blue black) or toluene-2,4-diamine (black): Light, moderate; Washing, good

Kalle Co., BP 515/94; USP 563386; GP ap. K11223 (Fr. 4, 957)
Compare USP 563383; GP 99164 (Fr. 5, 498)Soluble in water (navy blue); insoluble in ethanol
 H_2SO_4 conc. — blue; on dilution — reddish violet
Aqueous solution + HCl — soluble reddish violet ppt;
+ NaOH — reddish violet**22590 C.I. Direct Blue 2 (Dull blue)**Benzidine \rightleftharpoons (2) (alk.) Gamma acid
(1) (alk.) H acid

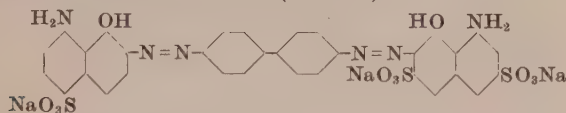
Discoverers — L. Gans and H. Hoffmann 1890

Cassella Co., BP 1742/91; USP 464135, 501500; FP 201770;
GP 74593 (Fr. 3, 684)

BIOS 1548, 194

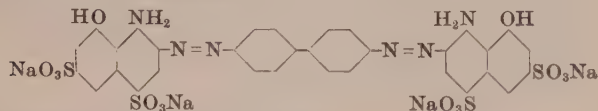
FIAT 764 — Diaminschwarz BH

Dubský & Okáň, Rec. Trav. Chim. 46, (1927), 296

Soluble in water deep violet to black
Slightly soluble in ethanol and Cellosolve
 H_2SO_4 conc. — blue; on dilution — reddish violet
 HNO_3 conc. — brownish violet solution
Aqueous solution + HCl conc. — reddish violet;
+ NaOH conc. — bordeaux**22595 C.I. Direct Blue 64 (Dull blue)**Benzidine \rightleftharpoons (alk.) S acid
(alk.) H acid

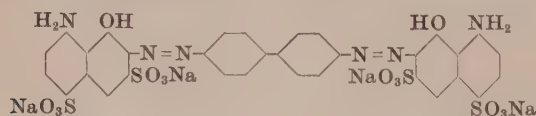
Discoverers — M. Ulrich and J. Bammann 1891

Bayer Co., BP 9636/91; USP 533508, 578432; GP ap. F5667

Soluble in water (blue)
Slightly soluble in Cellosolve; insoluble in other organic solvents
 H_2SO_4 conc. — bright blue; on dilution — violet
 HNO_3 conc. — blue solution, turns brown
Aqueous solution + HCl — blue ppt;
+ NaOH 10% purple**22600 Direct Dye**Benzidine \rightleftharpoons (acid) K acid (2 mol.)**Diamine Nitrazol Green BB (C)**Fastness Properties (C), coupled with diazotised *p*-nitro-aniline: Acid (organic) 4, Alkali 5, Light 3, Washing 3, Water 4

Dischargeability, very good

Cassella Co., GP 216636 (Fr. 9, 376)

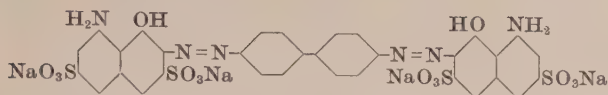
Aqueous solution + HCl conc. — dark blue, ppt;
+ NaOH conc. — violetVery soluble in water
 H_2SO_4 conc. — dark blue; on dilution — blue**22605 Direct Dye**Benzidine \rightleftharpoons (alk.) K acid (2 mol.)

Discoverers — F. Krecke and J. Rosenberg 1893

Naphthamine Blue 2B (K)Kalle Co., BP 515/94; USP 563383, 563385-6; GP ap. K11223
(Fr. 4, 957), GP 99164 (Fr. 5, 498)

Balls & Hancock, Proc. Roy. Soc. 93 (1922 (B)), 426

Soluble in water (violet); insoluble in ethanol
 H_2SO_4 conc. — violet; on dilution — blue solution, then violet ppt.
Aqueous solution + HCl — violet ppt;
+ NaOH — reddish violet

22610 C.I. Direct Blue 6 (Blue)

Benzidine \rightleftharpoons (alk.) H acid (2 mol.)

Aqueous solution + HCl conc. — navy blue, ppt;
+ NaOH conc. — dark violet, ppt.

Discoverers — J. Bammann and M. Ulrich 1890; C. Rudolph 1890;
M. Hoffmann 1890

Cassella Co., *BP* 1742/91; *USP* 464135, 501500; *FP* 201770

GP 74593 (*Fr.* 3, 684)

Bayer Co., *BP* 13443/90; *USP* 464135; *FP* 210033

BIOS 1548, 173

FIAT 764 — Benzoblau BB

JSDC, 9 (1893), 15

Soluble in water (blue to navy blue)

Slightly soluble in ethanol and Cellosolve

Insoluble in other organic solvents

H₂SO₄ conc. — bright blue; on dilution — violet to reddish blue

22620 C.I. Direct Black 15 (Navy to Bluish black)

Benzidine \rightleftharpoons (alk.) *N*-Ethyl Gamma acid
(alk.) H acid

Discoverers — C. Ris and C. Simon 1895

Geigy Co., *BP* 2771/96; *USP* 556164, 567413; *FP* 250697;
GP 103149 (*Fr.* 5, 576)

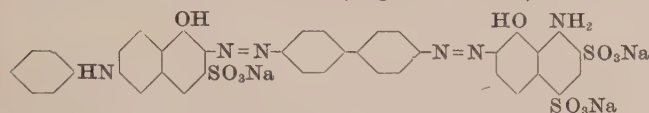
Soluble in water (dark blue)

Very slightly soluble in ethanol

H₂SO₄ conc. — blue; on dilution — dark violet ppt.

Aqueous solution + HCl — violet ppt;

+ NaOH — dark violet

22625 C.I. Direct Blue 177 (Bright reddish blue)

Benzidine \rightleftharpoons (alk.) *N*-Phenyl J acid
(alk.) Chicago acid

Soluble in water (reddish blue) and Cellosolve

Slightly soluble in ethanol

Insoluble in other organic solvents

H₂SO₄ conc. — blue; on dilution — dull bluish violet, ppt.

Aqueous solution + H₂SO₄ 10% — no change;

+ NaOH 10% — slightly bluer

22630 C.I. Direct Violet 38 (Violet)

Benzidine \rightleftharpoons (alk.) *N*-Carboxymethyl J acid (2 mol.)

Aqueous solution + HCl conc. — corinth, ppt;
+ NaOH conc. — bordeaux

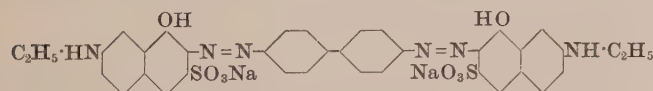
Discoverer — A. L. Laska 1902

Oehler, *BP* 5792/03; *USP* 724893-4, 728477; *GP* 152679
(*Fr.* 7, 428)

Soluble in water (deep violet)

Very slightly soluble in ethanol

H₂SO₄ conc. — blue; on dilution — corinth

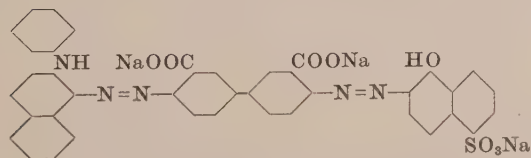
22640 Direct Dye

Benzidine \rightleftharpoons (alk.) *N*-Ethyl Gamma acid (2 mol.)

Discoverers — C. Ris and C. Simon 1895

Geigy Co., *BP* 2771/96; *USP* 556164; *FP* 250697; *GP* 91506
(*Fr.* 4, 975)

This constitution was incorrectly attributed in C.I. (1st Edn.) to Diphenyl Fast Grey B (Gy) and it is doubtful whether a dye of this constitution was ever marketed

22750 Direct Dye (Violet → Dull violet)*

3,3'-Dicarboxybenzidine \rightleftharpoons *N*-Phenyl-2-naphthylamine
1-Naphthol-5-sulfonic acid

Discoverer — R. Stüsser 1921

Benzo Fast Copper Violet B (By)

Fastness Properties (C), aftertreated with copper sulfate*:
Acid (organic) 3, Alkali 3, Light 5, Washing 3-4,
Water 3-4

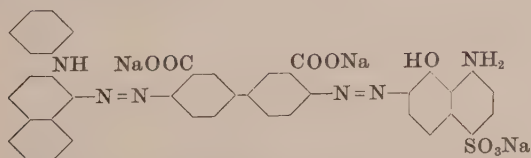
Bayer Co., *BP* 198398; *USP* 1457235; *FP* 546770; *GP* 380058,
410758, (*Fr.* 14, 993, 1502)

Soluble in water (bordeaux) and ethanol (bordeaux)

H₂SO₄ conc. — dark blue; on dilution — pale corinth

Aqueous solution + HCl conc. — dark corinth, ppt;

+ NaOH conc. — bordeaux to reddish violet

22755 Direct Dye

3,3'-Dicarboxybenzidine \rightleftharpoons *N*-Phenyl-2-naphthylamine
(alk.) S acid

Discoverer — R. Stüsser 1921

Benzo Fast Copper Blue B (By)

Fastness Properties (C), aftertreated with copper sulfate*:
Acid (organic) 3, Alkali 3, Light 5, Washing 3, Water 3

Bayer Co., *BP* 198398/22; *USP* 1457235; *FP* 546770; *GP* 380058,
410758 (*Fr.* 14, 993, 1502)

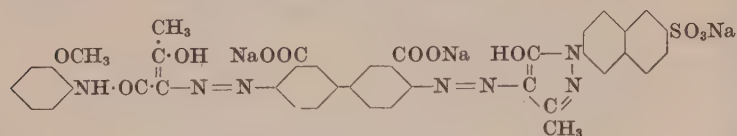
Soluble in water (dark violet)

Slightly soluble in ethanol (pale corinth)

H₂SO₄ conc. — bluish black; on dilution — deep reddish blue

Aqueous solution + HCl conc. — dark reddish blue, ppt;

+ NaOH conc. — dark violet

22770 C.I. Direct Brown 167 (Yellowish brown)*

3,3'-Dicarboxybenzidine $\begin{cases} \nearrow (2) \text{ } o\text{-Acetoacetaniside} \\ \searrow (1) \text{ 3-Methyl-1-(6-sulfo-2-naphthyl)-5-pyrazolone} \end{cases}$

* Aftertreated with copper sulfate

Discoverer — R. Stüsser 1921

Bayer Co., BP 198398; USP 1457235; FP 546770; GP 380058, 410758, (Fr. 14, 993, 1502)

BIOS 1548, 117

FIAT 764 — Benzoehckupferbraun 3GL

Soluble in water (yellowish brown)

Slightly soluble in ethanol

 H_2SO_4 conc. — reddish orange brown; on dilution — golden yellowAqueous solution + HCl conc. — yellowish brown, ppt;
+ NaOH conc. — yellowish brown, slight ppt.**22775 C.I. Direct Brown 186 (Blackish brown (reddish))***

3,3'-Dicarboxybenzidine $\begin{cases} \nearrow \text{Salicylic acid} \\ \searrow (alk.) \text{ Gamma acid} \end{cases}$

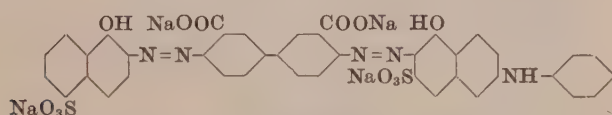
* With chromium salts

Discoverers — W. Neelmeier and R. Fischer (Bayer Co.) 1923

FIAT 764 — Chromsogaschwarzbraun 29427

Very soluble in water — (bordeaux);

Slightly soluble in ethanol

 H_2SO_4 conc. — violet; on dilution — pale reddish orange brownAqueous solution + HCl conc. — corinth, ppt;
+ NaOH conc. — orange brown**22780 C.I. Direct Violet 79 (Bluish violet \rightarrow Reddish blue)***

3,3'-Dicarboxybenzidine $\begin{cases} \nearrow (1) \text{ 1-Naphthol-5-sulfonic acid} \\ \searrow (2) (alk.) \text{ } N\text{-Phenyl J acid} \end{cases}$

* Aftertreated with copper sulfate

Discoverer — R. Stüsser 1927

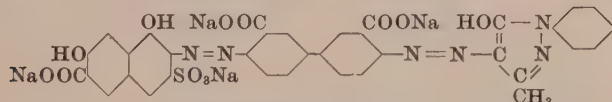
I.G., BP 286717; USP 1851121; FP 650688; GP 469340 (Fr. 16, 1006)

BIOS 1548, 108

FIAT 764 — Benzoehckupferviolett BBL

Soluble in water (violet)

Slightly soluble in ethanol

 H_2SO_4 conc. — deep blue; on dilution — bright violetAqueous solution + HCl conc. — violet, ppt;
+ NaOH conc. — bordeaux**22790 C.I. Direct Brown 168 (Blackish brown)***

3,3'-Dicarboxybenzidine $\begin{cases} \nearrow (2) \text{ 3,5-Dihydroxy-7-sulfo-2-naphthoic acid} \\ \searrow (1) \text{ 3-Methyl-1-phenyl-5-pyrazolone} \end{cases}$

* Aftertreated with copper sulfate

Discoverer — S. Petersen 1938

I.G., USP 2230696; FP 873117; GP 714985 (Fr.-Bayer, I-1, 1245)

BIOS 1548, 118

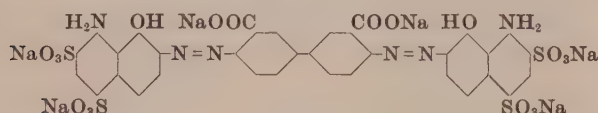
FIAT 764 — Benzoehckupferbraun TL

Soluble in water (bordeaux)

Slightly soluble in ethanol

 H_2SO_4 conc. — violet black; on dilution — pale brownAqueous solution + HCl conc. — chocolate brown, ppt;
+ NaOH conc. — dark brown**22800 C.I. Direct Blue 226 (Blue)**

Bis copper complex derived from

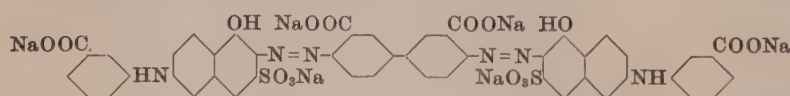
3,3'-Dicarboxybenzidine \rightleftharpoons Chicago acid (2 mol.)

and convert to the copper complex by adding copper sulfate and heating to 70°C

FIAT 764 — Benzoviscoseblau 3GFL

22810 C.I. Direct Blue 93 (Reddish blue)

Bis copper complex derived from

3,3'-Dicarboxybenzidine \rightleftharpoons *N-m*-Carboxyphenyl J acid (2 mol.)

then convert to the copper complex by heating with aqueous copper sulfate solution and ammonia at 90°C

Discoverers — J. Hilger and K. Wiedermann 1929

I.G., BP 333573; USP 1879240; FP 693024; GP 553045 (Fr. 18, 1030)

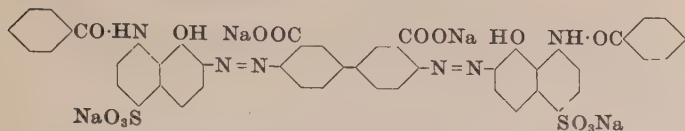
BIOS 1548, 133

FIAT 764 — Siriuslichtblau 3RL

Soluble in water (violet)

Very slightly soluble in ethanol

 H_2SO_4 conc. — blue; on dilution — violetAqueous solution + HCl conc. — reddish blue, ppt;
+ NaOH conc. — violet, ppt.

22815 Direct Dye

3,3'-Dicarboxybenzidine \rightleftharpoons (alk.) N-Benzoyl S acid (2 mol.)

Discoverer — C. Schraube 1890

Naphthyl Blue 4B (B)

Badische Co., BP 9676/90; USP 524220; FP 206501; GP 54662 (Fr. 2, 400)

Griess, Ber. 2 (1874), 1612

Loewenherz, Ber. 25 (1892), 2797

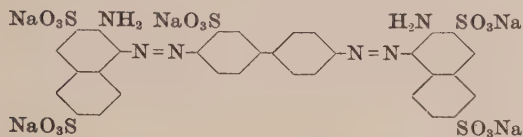
Soluble in water (blue)

Very slightly soluble in ethanol

H₂SO₄ conc. — blue; on dilution — violet ppt.

Aqueous solution + HCl — bluish violet ppt;

+ NaOH — magenta red

22850 Direct Dye

3-Sulfobenzidine \rightleftharpoons 3-Amino-2,7-naphthalenedisulfonic acid (2 mol.)

Discoverer — Bayer Co.

Trypan Red (MLB)

Formerly used for medicinal purposes

GP 44799 (Fr. 2, 405)

Griess & Duisberg, Ber. 22 (1889), 2462

Ehrlich & Shiga, Klin. Wochenschrift, (1904), 362

Dale, JSCI, 43 (1924), 933

Fürth, Koll. Z. 41 (1927), 300

Soluble in water (red)

Aqueous solution + HCl — blue ppt;

+ Acetic acid — unaltered

22855 C.I. Direct Brown 185 (Reddish brown)*

3-Sulfobenzidine \rightleftharpoons (1) Salicylic acid
(2) Resorcinol

* With chromium salts

Discoverers — W. Neelmeier and R. Fischer 1923

I.G., GP 408294 (Fr. 14, 1091), (Process of application)

FIAT 764 — Chromsogaorange 29451

Very soluble in water (yellowish orange)

Slightly soluble in ethanol

H₂SO₄ conc. — reddish violet; on dilution — brown

Aqueous solution + HCl conc. — orange brown, ppt;

+ NaOH conc. — reddish orange brown

22860 Direct Dye

3-Sulfobenzidine \rightleftharpoons Resorcinol (2 mol.)

Discoverers — A. Blank, J. Jansen and C. Heidenreich (Bayer Co.) 1912

Benzoform Bordeaux R (By)

FIAT 764 — Benzoforbordobordo R

Slightly soluble in water and ethanol (pale yellow)

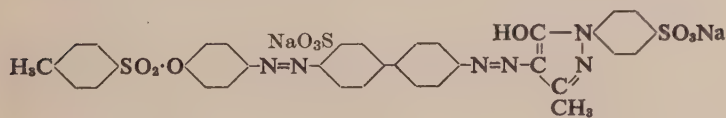
H₂SO₄ conc. — bordeaux; on dilution — pale brown

Aqueous solution + HCl conc. — brown, ppt;

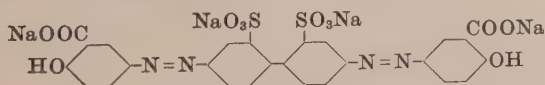
+ NaOH conc. — reddish orange brown

22870 C.I. Acid Orange 63 (Orange)

Alexander & Stacey Proc Roy Soc A212 (1952) 274



3-Sulfobenzidine \rightleftharpoons Phenol
3-Methyl-1-
(p-sulfophenyl)-5-pyrazolone

22880 C.I. Mordant Yellow 26 (Dull yellow)

2,2'-Disulfobenzidine \rightleftharpoons Salicylic acid (2 mol.)

Aqueous solution + HCl conc. — greenish yellow;
+ NaOH conc. — golden orange

Discoverer — E. Zehnter 1912

Durand & Huguenin, BP 27730/12; USP 1075134; FP 451169;

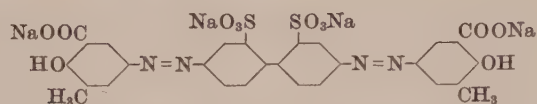
GP ap. D35040 (Fr. 11, 395)

FIAT 764 — Chromechtgelb RB

Soluble in water (yellow); very slightly soluble in ethanol, acetone and Cellosolve

Insoluble in other organic solvents

H₂SO₄ conc. — reddish yellow to orange; on dilution — pale greenish yellow; HNO₃ conc. — partial yellow solution

22885 Mordant Dye

2,2'-Disulfobenzidine \rightleftharpoons 2,3-Cresotic acid (2 mol.)

Discoverer — E. Zehntner 1912

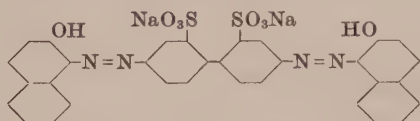
Chromocitronine RR (DH)

Durand & Huguenin, *BP* 27730/12; *USP* 1075134; *FP* 451169

Soluble in water (yellowish brown)

H_2SO_4 conc. — reddish orange; on dilution — reddish brown ppt.

Aqueous solution + HCl — reddish brown ppt;
+ NaOH — orange red

22890 C.I. Acid Red 97 (Bright yellowish red)

2,2'-Disulfobenzidine \rightleftharpoons 2-Naphthol (2 mol.)

Discoverer — Agfa 1886

GP 43100 (*Fr.* 2, 409)

BIOS 1548, 86. *FIAT* 764 — Saeureanthracenrot G

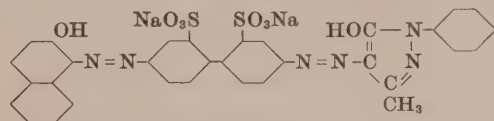
King, *JCS* (1932), 1273

Soluble in water (orange red), ethanol (orange), acetone and Cellosolve

H_2SO_4 conc. — reddish violet; on dilution — dull pink

HNO_3 conc. — dark bluish red, becoming orange

Aqueous solution + HCl conc. — reddish brown, ppt;
+ NaOH conc. — reddish orange brown

22895 C.I. Acid Orange 56 (Reddish orange)

2,2'-Disulfobenzidine \rightleftharpoons (2) 2-Naphthol
(1) 3-Methyl-1-phenyl-5-pyrazolone

Discoverer — H. Witter 1904

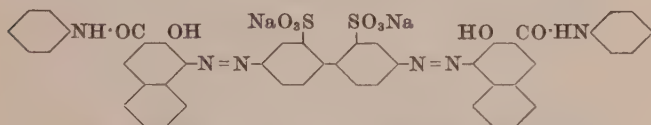
Bayer Co., *GP* 163142 (*Fr.* 8, 556)

FIAT 764 — Sulfonorange G

Soluble in water (brownish orange) and ethanol (golden orange)

H_2SO_4 conc. — blood red; on dilution — brownish orange

Aqueous solution + HCl conc. — orange brown, ppt;
+ NaOH conc. — orange brown

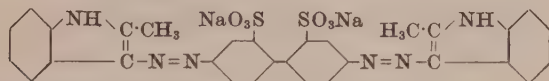
22900 C.I. Acid Red 144 (Bluish red)

2,2'-Disulfobenzidine \rightleftharpoons 3-Hydroxy-2-naphthanilide (2 mol.)

Soluble in water (bluish red)

H_2SO_4 conc. — reddish violet; on dilution — bluish red ppt.

Aqueous solution + HCl — bluish red ppt;
+ NaOH conc. — redder

22905 C.I. Acid Yellow 87 (Yellow)

2,2'-Disulfobenzidine \rightleftharpoons 2-Methylindole (2 mol.)

Discoverer — H. Witter 1904

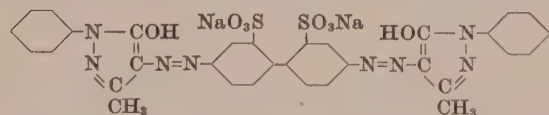
Bayer Co., *BP* 23072/04; *USP* 791526; *FP* 347326; *GP* 160674
(*Fr.* 8, 554)

FIAT 764 — Sulfongelb 5G

Aqueous solution + HCl conc. — golden orange;
+ NaOH conc. — golden orange

Soluble in water, slightly soluble in ethanol (lemon yellow)

H_2SO_4 conc. — lemon yellow; on dilution — lemon to golden yellow

22910 C.I. Acid Yellow 42 (Yellow \rightarrow Reddish yellow)

2,2'-Disulfobenzidine \rightleftharpoons 3-Methyl-1-phenyl-5-pyrazolone (2 mol.)

Discoverer — H. Witter 1904

Bayer Co., *BP* 23072/04; *USP* 791524; *FP* 347376; *GP* 160675
(*Fr.* 8, 555)

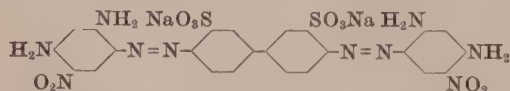
FIAT 764 — Sulfongelb R

Soluble in water (lemon yellow) and ethanol (lemon yellow)

Slightly soluble in acetone

H_2SO_4 conc. — lemon yellow; on dilution — lemon yellow

Aqueous solution + HCl conc. — lemon yellow;
+ NaOH conc. — lemon yellow

22920 C.I. Direct Orange 4 (Bright orange)

3,3'-Disulfobenzidine \rightleftharpoons 4-Nitro-*m*-phenylenediamine (2 mol.)

Discoverers — A. Bernthsen and P. Julius 1893

Badische Co., *BP* 8564/94; *USP* 545333; *FP* 238340; *GP* 80973
(*Fr.* 4, 855)

FIAT 764 — Pyraminorange R

Griess & Duisberg, *Ber.* 22 (1889), 2463

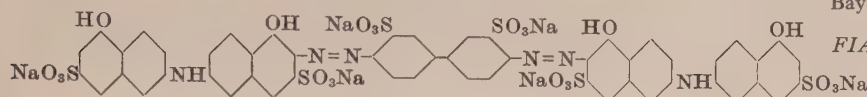
Moderately soluble in water (brownish orange) and ethanol (golden yellow)

H_2SO_4 conc. — golden yellow; on dilution — orange brown

Aqueous solution + HCl conc. — orange to reddish brown, ppt;
+ NaOH conc. — orange brown, ppt.

22930 C.I. Direct Violet 25 (Dull bluish violet)

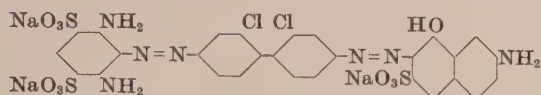
Discoverer — O. Günther 1910

Bayer Co., BP 21199/10, 27627/10; USP 1009741; FP 433015; GP 241629 (Fr. 10, 900)
FIAT 764 — Brillantbenzoviolett BBH3,3'-Disulfobenzidine \rightleftharpoons Di J acid (2 mol.)Soluble in water (deep violet); very slightly soluble in ethanol
H₂SO₄ conc. — blue; on dilution — violet
Aqueous solution + HCl conc. — dark blue, ppt;
+ NaOH conc. — navy blue, ppt.**23000 C.I. Acid Brown 32 (Reddish brown)**

Selan Printing Brown 3R (By)

Discoverer — Bayer Co. 1925

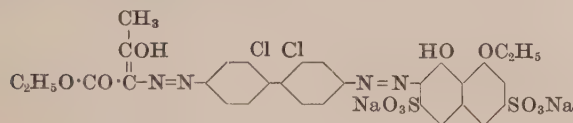
FIAT 764 — Selandruckbraun 3R

2,2'-Dichlorobenzidine $\begin{cases} (1) \text{ (acid) 4,6-Diamino-}m\text{-benzenedisulfonic acid} \\ (2) \text{ (alk.) Gamma acid} \end{cases}$ Soluble in water (orange brown); almost insoluble in ethanol
H₂SO₄ conc. — bordeaux; on dilution — brownish orange
Aqueous solution + HCl conc. — orange brown;
+ NaOH conc. — orange brown**23005 Acid Dye**

Discoverer — Bayer Co. 1912

Acid Anthracene Red BBL (By)

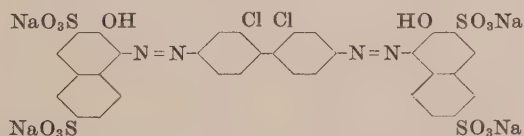
GP 268067 (Fr. 11, 383)

2,2'-Dichlorobenzidine $\begin{cases} (2) \text{ Acetoacetic acid ethyl ester} \\ (1) \text{ 8-Ethoxy-1-naphthol-3,6-disulfonic acid} \end{cases}$ Soluble in water (red); slightly soluble in ethanol (orange red)
H₂SO₄ conc. — dark violet; on dilution — red
Aqueous solution + HCl conc. — red;
+ NaOH conc. — brown**23010 C.I. Acid Red 152 (Red)**

Discoverer — E. Meyer 1907

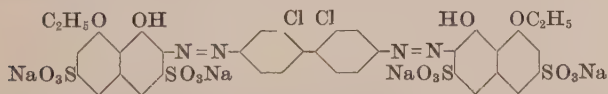
Bayer Co., BP 23182/07; USP 888522; FP 383128; GP 196989 (Fr. 9, 313)

FIAT 764 — Saeureanthracenrot 5BL

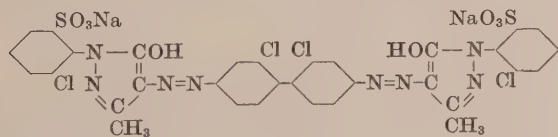
2,2'-Dichlorobenzidine \rightleftharpoons R acid (2 mol.)Soluble in water (orange red); very slightly soluble in ethanol (weak pink); insoluble in acetone and toluene
H₂SO₄ conc. — magenta red; on dilution — orange red
Aqueous solution + HCl conc. — red;
+ NaOH conc. — reddish orange brown**23015 Acid Dye**

Acid Anthracene Red 5BD (By)

Bayer Co., GP 268067 (Fr. 11, 383)

2,2'-Dichlorobenzidine \rightleftharpoons 8-Ethoxy-1-naphthol-3,6-disulfonic acid (2 mol.)Soluble in water (red)
Slightly soluble in ethanol (pink)
H₂SO₄ conc. — deep blue; on dilution — red
Aqueous solution + HCl conc. — red;
+ NaOH conc. — wine red**23030 Acid Dye**

Azo Milling Yellow 5G (IG)

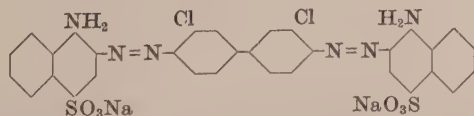
2,2'-Dichlorobenzidine \rightleftharpoons 1-(2-Chloro-6-sulfophenyl)-3-methyl-5-pyrazolone (2 mol.)**23040 C.I. Direct Red 61 (Bluish red)**

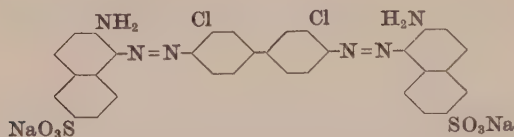
Discoverer — H. Pfeiffer 1896

Levinstein Ltd., BP 25725/96; USP 625174; FP 265155; GP 94410 (Fr. 4, 73), GP 97101 (Fr. 5, 75)

BIOS 1548, 159

FIAT 764 — Benzorot 10B

3,3'-Dichlorobenzidine \rightleftharpoons Naphthionic acid (2 mol.)Soluble in water (red to bluish red) and ethanol (reddish orange)
Slightly soluble in acetone
H₂SO₄ conc. — blue; on dilution — pale blue
Aqueous solution + HCl conc. — corinth, ppt;
+ NaOH conc. — magenta red, ppt.

23045 Direct Dye

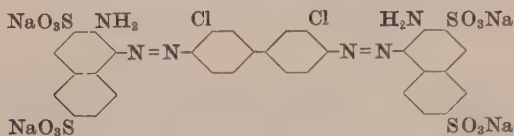
3,3'-Dichlorobenzidine \rightarrow Broenner's acid (2 mol.)

Discoverer — H. Pfeiffer 1896

Dianol Red B (Lev)

Levinstein Ltd., BP 25725/96; USP 625174; FP 265155; GP 94410 (Fr. 4, 73), GP 97101 (Fr. 5, 75)

Soluble in water and ethanol (yellowish red)
 H_2SO_4 conc. — blue; on dilution — brown
 Aqueous solution + HCl — violet red;
 + NaOH — unaltered

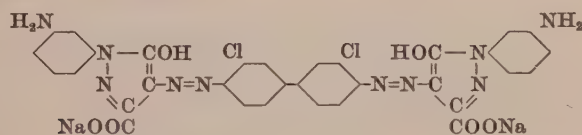
23050 C.I. Direct Red 46 (Bright bluish red)

3,3'-Dichlorobenzidine \rightarrow 3-Amino-2,7-naphthalenedisulfonic acid (2 mol.)

Chloramine Red 8BS contains 6% of C.I.23045 (BIOS 1548)

Discoverers — H. Pfeiffer 1896; C. Rudolph and J. Herbabny 1896
 Levinstein Ltd., BP 25725/96; USP 625174; FP 265155; GP 94410 (Fr. 4, 73), GP 97101 (Fr. 5, 75)
 Oehler, USP 594123; GP ap. 02572 (Fr. 5, 599)
 BIOS 1548, 161
 FIAT 764 — Chloraminrot 8BS

Soluble in water (red to bluish red); insoluble in ethanol and other organic solvents
 H_2SO_4 conc. — blue; on dilution — pale reddish brown
 Aqueous solution + HCl conc. — reddish brown, ppt;
 + NaOH conc. — red, ppt; + NaOH 10% — yellowish red

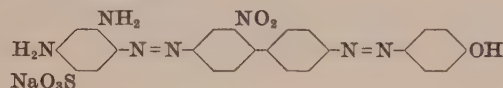
23070 Direct Dye

3,3'-Dichlorobenzidine \rightarrow 3-Carboxy-1-m-nitrophenyl-5-pyrazolone (2 mol.)
 and finally reduce the nitro groups

Discoverer — Oehler

Triazogen Red BB (By)

Soluble in water (orange brown)
 Slightly soluble in ethanol (pale pink)
 H_2SO_4 conc. — reddish violet; on dilution — brownish orange
 Aqueous solution + HCl conc. — reddish orange brown, ppt;
 + NaOH conc. — brownish orange

23080 Direct Dye

2-Nitrobenzidine $\xrightarrow{(1)}$ 2,4-Diaminobenzenesulfonic acid
 $\xrightarrow{(2)}$ Phenol

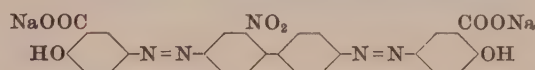
Aqueous solution + HCl conc. — brown, ppt;
 + NaOH conc. — unchanged

Discoverer — W. Bergdolt 1910

Para Orange G (By)

Fastness Properties (C), coupled with diazotised *p*-nitro-aniline: Acid (organic) 2, Alkali 4, Light 2, Washing 2-3, Water 4
 Dischargeability, good — very good
 Bayer Co., BP 9528/11; USP 1009952; FP 431543; GP ap. F30428 (Fr. 10, 920)
 FIAT 764 — Paraorange G

Soluble in water and ethanol (reddish yellow)
 H_2SO_4 conc. — violet; on dilution — pale orange brown

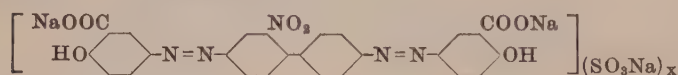
23090 C.I. Mordant Yellow 48 (Dull reddish yellow)

2-Nitrobenzidine \rightarrow Salicylic acid (2 mol.)

Discoverer — Bayer Co. 1895

Kalle Co., BP 9454/95; FP 203468, 247382; GP 87484 (Fr. 4, 710)
 FIAT 764 — Chromgelb R ex.

Moderately soluble in water (greenish yellow)
 Slightly soluble in ethanol (greenish yellow)
 H_2SO_4 conc. — orange brown; on dilution — pale yellow
 Aqueous solution + HCl conc. — paler greenish yellow;
 + NaOH conc. — brownish orange

23091 Mordant Dye

Sulfonate C.I.23090

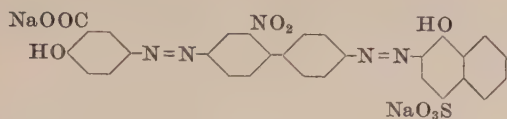
Discoverers — K. Elbel and J. Rosenberg 1895

Salicine Yellow G (K) dyes cotton and chromed wool yellow

Dyeings on wool are of very low fastness to most agencies
 Kalle Co., BP 9454/95; GP 87484 (Fr. 4, 710)

Soluble in water (orange)
 H_2SO_4 conc. — orange yellow; on dilution — brownish yellow ppt.

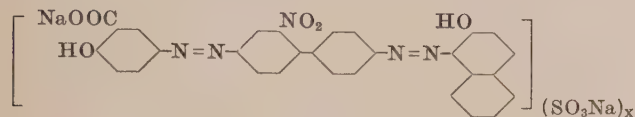
Aqueous solution + HCl — brownish yellow ppt;
 + NaOH — reddish brown

23095 C.I. Mordant Red 8 (Dull yellowish red)

2-Nitrobenzidine $\begin{cases} (1) \text{ Salicylic acid} \\ (2) \text{ Neville and Winther's acid} \end{cases}$

Discoverers — R. Gnehm and J. Schmid 1892
Ciba, *BP* 13475/92; *USP* 493583; *FP* 223176; *GP* 72867
(*Fr.* 3, 643)
FIAT 764 — Anthracenrot
JSDC, 9 (1893), 126

Soluble in water (red)
Slightly soluble in ethanol (reddish orange)
 H_2SO_4 conc. — bordeaux; on dilution — cloudy pink
Aqueous solution + HCl conc. — pale red;
+ NaOH conc. — orange brown

23100 Mordant Dye

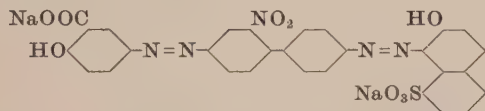
2-Nitrobenzidine $\begin{cases} \text{Salicylic acid} \\ \text{2-Naphthol} \end{cases}$

then sulfonate the product

The dyes have different properties from those obtained by coupling tetrazotised nitrobenzidine with salicylic acid and various 2-naphthol-sulfonic acids and it would appear that the sulfonic acid group (or groups) enters the biphenyl residue

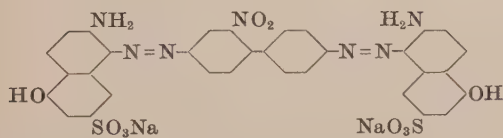
Discoverers — K. Elbel and J. Rosenberg 1894
Salicine Red B, G, GG (K) dye wool or chromed wool red from an acid bath
Kalle Co., *BP* 9454/95; *GP* 87484 (*Fr.* 4, 710)

For the several related dyes —
 H_2SO_4 conc. — orange red to violet red; on dilution — reddish brown ppts.

23105 Mordant Dye

2-Nitrobenzidine $\begin{cases} (1) \text{ Salicylic acid} \\ (2) \text{ Crocein acid} \end{cases}$

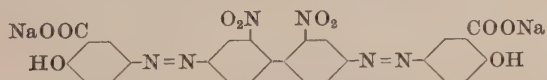
Discoverer — Kalle Co.
Salicine Orange RR (K)
Dyes of similar constitution —
Ciba, *BP* 13475/92; *USP* 493583; *FP* 223176; *GP* 72867 (*Fr.* 3, 643)
Kalle Co., *GP* 166980 (*Fr.* 8, 628)

23110 Direct Dye

2-Nitrobenzidine \rightleftharpoons (acid) J acid (2 mol.)

Discoverer — Bayer Co. 1912
Benzo Nitrol Bordeaux G (By)

Moderately soluble in water (orange brown)
Very slightly soluble in ethanol
 H_2SO_4 conc. — olive; on dilution — brown
Aqueous solution + HCl conc. — brown, ppt;
+ NaOH conc. — reddish brown, ppt.

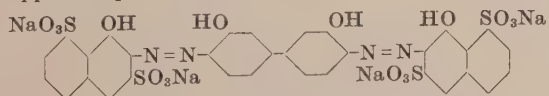
23130 C.I. Mordant Yellow 21 (Reddish yellow)

2,2'-Dinitrobenzidine \rightleftharpoons Salicylic acid (2 mol.)

Soluble in water (yellowish orange)
 H_2SO_4 conc. — cerise red; on dilution — yellowish brown ppt.
Aqueous solution + HCl — yellowish brown ppt;
+ NaOH conc. — reddish brown

23150 C.I. Direct Blue 95 (Bright blue)

Bis Copper complex, derived from



o-Dianisidine \rightleftharpoons 1-Naphthol-3,8-disulfonic acid (2 mol.);

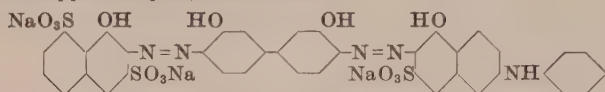
then make an intimate mixture of the paste dye with aqueous copper sulfate and sodium acetate (agitate for 1½ days) and dry under vacuum at 120–125°C. The two methoxyl groups are replaced by hydroxyl groups during the process

Discoverer — I.G. 1931
FIAT 764 — Benzoviskoseblau RL

Soluble in water (violet); insoluble in ethanol
 H_2SO_4 conc. — turquoise blue; on dilution — reddish blue
Aqueous solution + HCl conc. — blue, ppt;
+ NaOH conc. — violet

23155 C.I. Direct Blue 98 (Blue)

Bis Copper complex, derived from



o-Dianisidine \nearrow 1-Naphthol-3,8-disulfonic acid
 \searrow *N*-Phenyl J acid;

then make an intimate mixture of the paste dye with an aqueous solution of copper sulfate and sodium acetate by mixing for 1½ days and then dry under vacuum at 120–125°C. The two methoxyl groups are replaced by hydroxyl groups during the process

Discoverers — R. Stüsser and R. Wiedemann 1930

I.G., BP 352956; USP 1889732; FP 712993; GP *ap.* I1930

(Fr. 18,1035)

BIOS 1548, 132

FIAT 764 — Siriuslichtblau FBGL

Soluble in water (reddish blue)

Very slightly soluble in ethanol

H₂SO₄ conc. — greenish blue; on dilution — dullish violet

Aqueous solution + HCl conc. — violet, ppt;

+ NaOH conc. — reddish blue ppt.

23160 C.I. Direct Blue 84 (Blue)

Bis Copper complex, derived from

*o*-Dianisidine \rightleftharpoons Chromotropic acid (2 mol.);

then make an intimate mixture of the paste dye and an aqueous solution of copper sulfate and ammonia and dry in vacuum at 120–125°C. The two methoxyl groups are replaced by hydroxyl groups during the process

Discoverers — K. Wiedemann and H. Clingstein 1931

I.G., BP 407684; USP 1921337; FP 742953; GP 616676 (Fr. 20, 1172)

BIOS 1548, 133

FIAT 764 — Siriuslichtblau GL

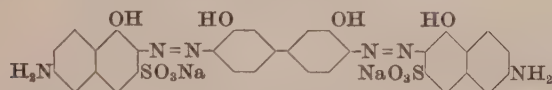
Soluble in water (blue)

Insoluble in ethanol

H₂SO₄ conc. — greenish blue; on dilution — blue

Aqueous solution + HCl conc. — reddish blue, ppt.

+ NaOH conc. — blue, ppt.

23165 C.I. Direct Blue 166 (Bright blue)*3,3'-Dihydroxybenzidine \rightleftharpoons (alk.) J acid (2 mol.)

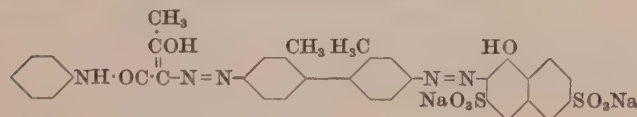
* Aftertreated with a copper salt

Discoverer — Ciba

Su.P 246422

Frahm, Chem. Weekbl. 48 (1952), 129

Soluble in water (red-purple)

H₂SO₄ conc. — blueNa₂CO₃ 10% — purple**23250 C.I. Acid Red 164 (Bright yellowish red)**

m-Tolidine \nearrow (2) Acetoacetanilide
 \searrow (1) 1-Naphthol-3,6-disulfonic acid

Discoverer — Badische Co. 1928

BIOS 1548, 53

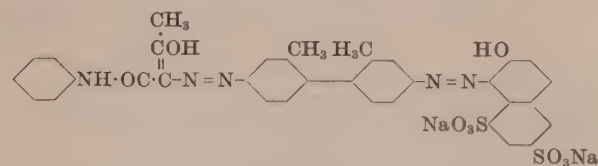
FIAT 764 — Supranolscharlach G

Soluble in water (red) and ethanol (orange)

H₂SO₄ conc. — cherry red; on dilution — orange

Aqueous solution + HCl conc. — red;

+ NaOH conc. — yellowish brown

23255 C.I. Acid Orange 79 (Reddish orange)

m-Tolidine \nearrow (2) Acetoacetanilide
 \searrow (1) G acid

Discoverer — Badische Co. 1928

BIOS 1548, 46

FIAT 764 — Supranolorange RR

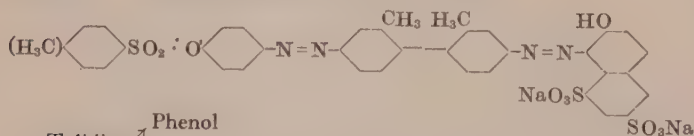
Soluble in water (orange) and ethanol (golden orange)

Slightly soluble in benzene and acetone

H₂SO₄ conc. — reddish orange; on dilution — orange

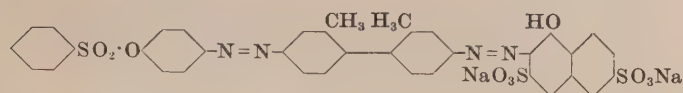
Aqueous solution + HCl conc. — orange;

+ NaOH conc. — yellowish brown

23260 C.I. Acid Orange 49 (Reddish orange)

m-Tolidine \nearrow Phenol
 \searrow G acid

and esterify by treatment with benzene(or toluene)sulfonyl chloride

23265 Acid Dye

m-Tolidine $\begin{cases} \nearrow (2) \text{ Phenol} \\ \searrow (1) \text{ 1-Naphthol-3,6-disulfonic acid} \end{cases}$

and esterify by treatment with benzenesulfonyl chloride

Supranol Scarlet FGN (IG)

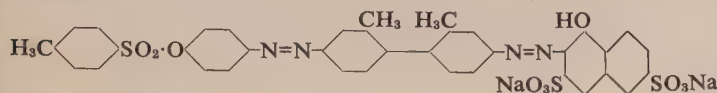
Geigy Co., BP 25866/12; USP 1067881; FP 450866; GP 261047

(Fr. 11, 389)

BIOS 1548, 54

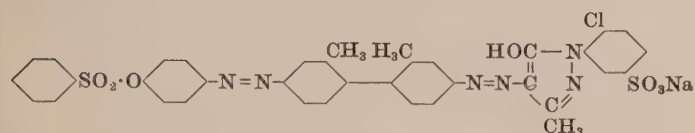
FIAT 764 — Supranolscharlach FGN

Soluble in water (red) and ethanol (orange)
H₂SO₄ conc. — cherry red; on dilution — orange
Aqueous solution + HCl conc. — red;
+ NaOH conc. — orange brown

23266 C.I. Acid Red 111 (Bright yellowish red)

m-Tolidine $\begin{cases} \nearrow (2) \text{ Phenol} \\ \searrow (1) \text{ 1-Naphthol-3,6-disulfonic acid} \end{cases}$

and esterify with *p*-toluenesulfonyl chloride

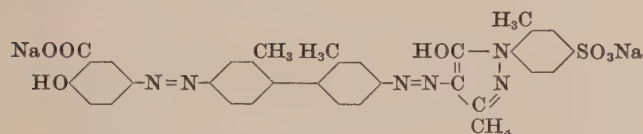
23270 C.I. Acid Yellow 68 (Yellow)

m-Tolidine \nearrow Phenol

1-(2-Chloro-5-sulphophenyl)-3-methyl-5-pyrazolone

and esterify by treatment with benzenesulfonyl chloride

FIAT 764 — Supranolgelb GG

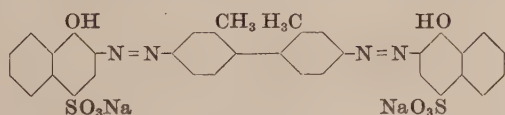
23275 Acid Dye

m-Tolidine $\begin{cases} \nearrow (1) \text{ Salicylic acid} \\ \searrow (2) \text{ 3-Methyl-1-(4-sulfo-}o\text{-tolyl)-5-pyrazolone} \end{cases}$

Azo Milling Yellow R (IG)

Fastness Properties: Light, Stoving and Washing, good
Levelling (weak acid), moderate

FIAT 764 — Azowalkgelb R

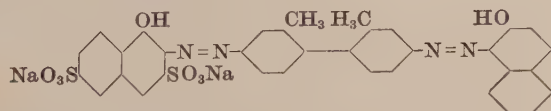
23280 Acid Dye

m-Tolidine \rightleftharpoons Neville and Winther's acid (2 mol.)

Discoverer — Oehler

Azo Milling Red RR (By)

Soluble in water (red) and ethanol (orange red)
H₂SO₄ conc. — violet; on dilution — magenta red
Aqueous solution + HCl conc. — magenta red;
+ NaOH conc. — orange brown

23285 C.I. Acid Red 99 (Red)

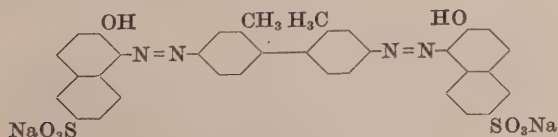
m-Tolidine $\begin{cases} \nearrow (1) \text{ 1-Naphthol-3,6-disulfonic acid} \\ \searrow (2) \text{ 2-Naphthol} \end{cases}$

Discoverer — Badische Co. 1928

BIOS 1548, 55

FIAT 764 — Supranolrot RX

Soluble in water (red) and ethanol (orange)
H₂SO₄ conc. — deep violet; on dilution — pink
Aqueous solution + HCl conc. — red;
+ NaOH conc. — orange brown

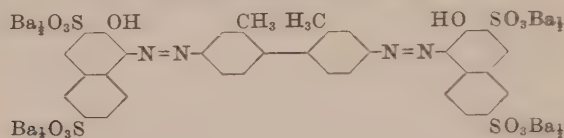
23290 C.I. Acid Red 173 (Yellowish red)

m-Tolidine \rightleftharpoons Schæffer's acid (2 mol.)

Discoverers — H. Wagner and J. Kohlhaas 1911

M.L.B., BP 21729/12; USP 1071833; FP 448442; GP 261555
(Fr. 11, 386)

23295 C.I. Pigment Red 62 (Bright bluish red)



m-Tolidine \rightarrow R acid (2 mol.)

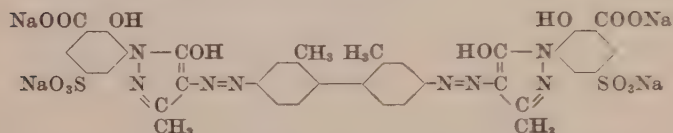
BIOS 1661, 147

FIAT 764 — Pigmentcarmin 3B Plv.

The sodium salt was the Acid dye Azo Milling Red B (IG)

23310 C.I. Acid Yellow 86 (Yellow)*

Bis Chromium complex formed from



m-Tolidine \rightarrow 1-(3-Carboxy-2-hydroxy-5-sulphophenyl)-3-methyl-5-pyrazolone (2 mol.)

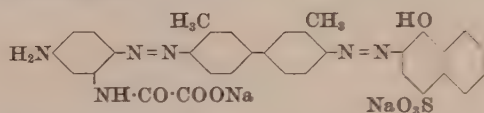
* On leather

Discoverers — H. Krzikalla and H. Pfitzner 1937

I.G., GP 727700 (Fr.-Bayer, I-1, 875)

FIAT 764 — Ergänilgelb RCN

23350 Direct Dye



o-Tolidine \rightarrow *m*-Aminooxanilic acid
Nevile and Winther's acid

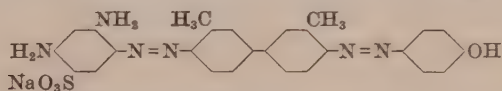
Discoverer — Markfeldt 1894

Oxamine Violet GR (R)

Remy, BP 22114/95; FP 252140; GP 99126 (Fr. 5, 594)

Soluble in water — (bluish red) and ethanol
 H_2SO_4 conc. — blue; on dilution — violet ppt.
Aqueous solution + HCl — violet ppt;
+ NaOH — redder solution and ppt.

23360 C.I. Direct Brown 147 (Dull orange \rightarrow Brown)*



o-Tolidine \rightarrow (1) 2,4-Diaminobenzenesulfonic acid
(2) Phenol

* Coupled with diazotised *p*-nitroaniline

Discoverer — W. Bergdolt 1908

Bayer Co., BP 9528/11; USP 1009952; GP *ap.* F30428 (Fr. 10, 920)

FIAT 764 — Parabraun 3G

Moderately soluble in water (orange brown)
Slightly soluble in ethanol (yellowish orange)
 H_2SO_4 conc. — dark blue; on dilution — pale brown
Aqueous solution + HCl conc. — dark brown ppt;
+ NaOH conc. — orange brown

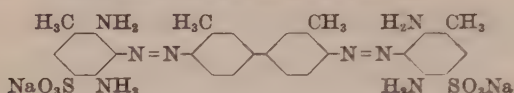
23365 C.I. Direct Orange 6 (Yellowish orange)



o-Tolidine \rightarrow (1) 2,4-Diaminobenzenesulfonic acid
(2) 2,3-Cresotic acid

Aqueous solution + HCl conc. — yellowish brown;
+ NaOH conc. — orange

23370 C.I. Direct Orange 10 (Bright orange)



o-Tolidine \rightarrow 4,6-Diamino-*m*-toluenesulfonic acid (2 mol.)

Toluylene Orange R for Sogah Merah (By) was

o-Tolidine \rightarrow (1) [4,6-Diamino-*m*-benzenedisulfonic acid (40%)
4,6-Diamino-*m*-toluenesulfonic acid (60%)]
(2) 4,6-Diamino-*m*-toluenesulfonic acid

Discoverers — P. Friedländer and B. Priebis 1886

Oehler, BP 4492/87; GP 40905 (Fr. 1, 467)

FIAT 764 — Toluylenorange R, Toluylenorange R fuer Sogah Merah

Soluble in water (golden yellow to orange) and Cellosolve
Slightly soluble in ethanol (yellowish brown)
Insoluble in other organic solvents
 H_2SO_4 conc. — reddish brown; on dilution — golden orange, ppt; HNO_3 conc. — brown solution, turns green
Aqueous solution + HCl conc. — reddish orange brown, ppt;
+ NaOH conc. — golden orange

23375 C.I. Direct Orange 6 (Yellowish orange)

o-Tolidine $\begin{cases} (2) \text{ 4,6-Diamino-}m\text{-toluenesulfonic acid} \\ (1) \text{ Salicylic acid} \end{cases}$

Discoverers — C. Rudolph and B. Priebs 1888
Oehler, *BP* 7997/88; *USP* 395634; *GP* 47235 (*Fr.* 2, 353)
BIOS 1548, 154
FIAT 764 — Plutoorange G

Soluble in water (yellowish orange) and ethanol
Very soluble in Cellosolve
Insoluble in other organic solvents
 H_2SO_4 conc. — reddish violet; on dilution — brown ppt; HNO_3 conc. — reddish violet solution (incomplete), turns brown

23380 C.I. Direct Orange 7 (Yellowish orange)

o-Tolidine $\begin{cases} (2) \text{ 4,6-Diamino-}m\text{-toluenesulfonic acid} \\ (1) \text{ 2,3-Cresotic acid} \end{cases}$

Aqueous solution + HCl conc. — yellowish brown, ppt;
+ NaOH conc. — brownish orange, ppt.

Discoverers — C. Rudolph and B. Priebs 1888
Oehler, *BP* 7997/88; *USP* 395634; *GP* 47235 (*Fr.* 2, 353)
FIAT 764 — Toluleneorange GL
Kallab, *Mitt. Gew. Mus.* 45 (1888), 114; cf. *JSCI*, 8 (1889), 540
JSDC, 14 (1898) 230

Soluble in water (golden orange)
Moderately soluble in ethanol (golden yellow)
 H_2SO_4 conc. — violet (+ dark blue); on dilution — dull yellowish brown

23385 Direct Dye (Yellowish orange)

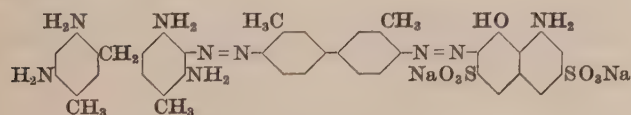
o-Tolidine $\begin{cases} (1) \text{ 2,4-Cresotic acid} \\ (2) \text{ 4,6-Diamino-}m\text{-toluenesulfonic acid} \end{cases}$

Aqueous solution + HCl conc. — yellowish brown, ppt;
+ NaOH conc. — orange brown, ppt.

Discoverers — C. Rudolph and B. Priebs 1888
Tolulene Orange G (By)

Fastness Properties (C): Acid (organic) 3, Alkali 3-4,
Light 1, Washing 1-2, Water 2
Dischargeability: neutral, fairly good; alkaline, fair
May be coupled with diazotised *p*-nitroaniline or aftertreated
with dichromate and copper sulfate
Oehler, *BP* 7997/88; *USP* 395634; *GP* 47235 (*Fr.* 2, 353)

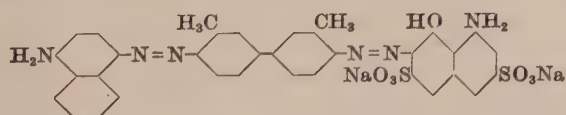
Moderately soluble in water and ethanol (golden yellow)
 H_2SO_4 conc. — reddish violet; on dilution — pale yellowish brown

23390 Direct Dye

o-Tolidine $\begin{cases} (2) \text{ 5,5'-Methylenedi(toluene-2,4-diamine)} \\ (1) \text{ (alk.) H acid} \end{cases}$

Discoverer — Oehler
Tolulene Black Blue RO (By)

Soluble in water (dull violet); very slightly soluble in ethanol
 H_2SO_4 conc. — blue; on dilution — violet
Aqueous solution + HCl conc. — dullish violet;
+ NaOH conc. — corinth

23400 Direct Dye

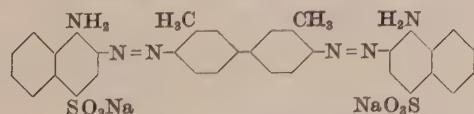
o-Tolidine $\begin{cases} (1) \text{ 1-Naphthylamine} \\ (2) \text{ (alk.) H acid} \end{cases}$

Discoverer — C. Rudolph 1890

Azo Mauve B (Gr E)

Of moderate fastness to acid, alkali and washing
Converted to black, fast to alkali and washing, on development
with toluene-2,4-diamine
Oehler, *BP* 10861/91; *USP* 462415; *GP* 70201 (*Fr.* 3, 692)
Bayer Co., *BP* 13443/90; *USP* 608999; *FP* 210033

Soluble in water (reddish violet); insoluble in ethanol
 H_2SO_4 conc. — blue; on dilution — bluish violet, ppt.
Aqueous solution + HCl — violet ppt; + NaOH — violet

23500 C.I. Direct Red 2 (Bright red)

o-Tolidine \rightleftharpoons Naphthionic acid (2 mol.)

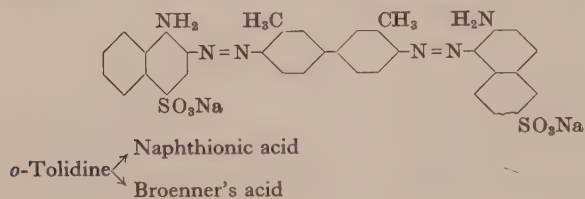
Discoverers — G. Schultz 1884; C. Duisberg 1885
Agfa, *GP* 35615 (*Fr.* 1, 473)
Bayer Co., *BP* 3803/85; *USP* 329632; *FP* 167876
Dawson & Hirsch, *BP* 14432/90
Badische Co., *BP* 6697/95, 17260/95; *FP* 248210; *GP* 84893,
88597, (*Fr.* 4, 846, 854)
BIOS 1548, 165
FIAT 764 — Benzopurpurin 4B
Knecht, *JSDC*, 1 (1885), 267
Bernthsen, *Chem. Z.* 19 (1895), 2167
Knecht & Hibbert, *Ber.* 36 (1903), 1553
Knecht & Batey, *JSDC*, 25 (1909), 197
Hantzsch, *Ber.* 48 (1915), 166
Dyer & Cal. Printer, 39 (1918), 20
Zsigmondy, *Z. phys. Chem.* 111 (1924), 211
Liepatoff, *Koll. Z.* 39 (1926), 230
Fierz-David & Blangey, 294

Soluble in water (red to brownish red) and Cellosolve

Soluble in ethanol and acetone
Insoluble in other organic solvents
 H_2SO_4 conc. — reddish blue; on dilution — pale greenish blue, ppt.
 HNO_3 conc. — blue solution, turns yellow brown
Aqueous solution + HCl conc. — violet black, ppt;
+ NaOH conc. — orange brown, ppt; + NaOH 10% — red
solution

23505 C.I. Direct Red 67 (Bright yellowish red)

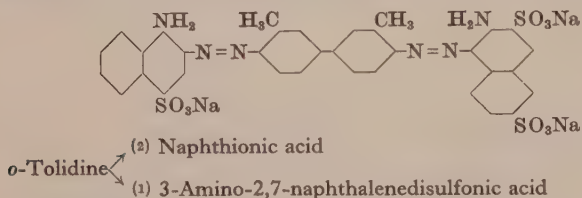
Agfa, BP 15296/85, 2213/86; USP 344971, 358865; FP 160722;
GP 39096 (Fr. 1, 474)



Soluble in water (yellowish red)
 H_2SO_4 conc. — violet blue; on dilution — violet blue ppt.
Aqueous solution + HCl — violet blue
+ NaOH — rather yellower

23510 C.I. Direct Red 15 (Red)

Discoverers — R. Krügener and O. Borgmann 1887
Agfa, BP 6687/87; USP 468530; FP 160722; GP 41095, 41362,
(Fr. 1, 476–7)
FIAT 764 — Brillantpurpurin R

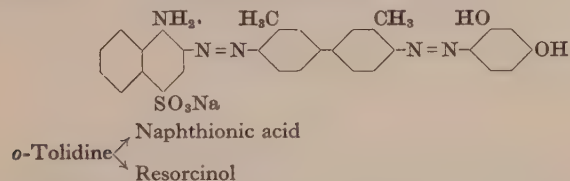


(In some brands part of the naphthionic acid may be replaced by Broenner's acid)

Soluble in water (brownish orange)
Moderately soluble in ethanol
 H_2SO_4 conc. — blue; on dilution — violet grey
Aqueous solution + HCl conc. — brown, ppt;
+ NaOH conc. — brownish orange, ppt.

23515 C.I. Direct Red 68 (Bright red)

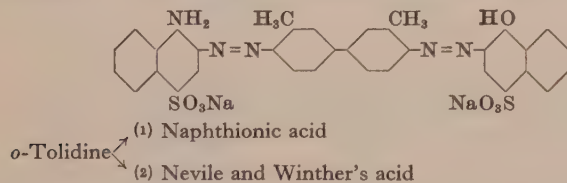
Discoverer — Pfaff 1885
Agfa, BP 15296/85, 2213/86; FP 160722; GP 39096 (Fr. 1, 474)



Soluble in water — brownish red
 H_2SO_4 conc. — blue; on dilution — violet ppt. Dilute acetic acid — brown ppt.
Aqueous solution + HCl — violet ppt;
+ NaOH — scarcely altered

23520 C.I. Direct Violet 21 (Dull reddish violet)

Discoverer — Pfaff 1885
Agfa, BP 15296/85, 2213/86, 6687/87; USP 344971, 358865,
FP 160722; GP 39096 (Fr. 1, 474)
FIAT 764 — Congokorinth B

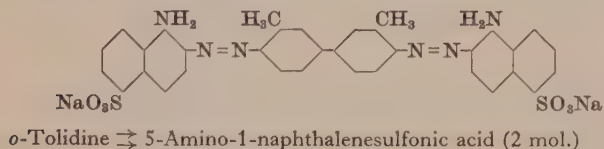


(In some brands part of the naphthionic acid may be replaced by 6-Amino-1-naphthalenesulfonic acid)

Soluble in water (corinth) and ethanol (magenta red)
 H_2SO_4 conc. — blue; on dilution — reddish blue
Aqueous solution + HCl conc. — dark navy blue, ppt;
+ NaOH conc. — wine red

23530 Direct Dye

Discoverers — Pfaff and C. Duisberg 1885

**Benzopurpurine 6B (By)**

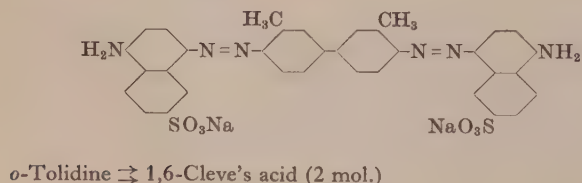
Fastness properties: Acid, poor; Alkali, very good; Light and Washing, moderate
Agfa, GP 35615 (Fr. 1, 473)
Bayer Co., BP 3803/85; USP 329632; FP 167876
JSDC, 9 (1893), 174 (Diazo Brilliant Black)
Chem. Ind. 17 (1894), 37

Aqueous solution + HCl — blue ppt; + Acetic acid — blue ppt;
+ NaOH — red solution and ppt.

Soluble in water (yellowish red)
 H_2SO_4 conc. — blue; on dilution — blue ppt.

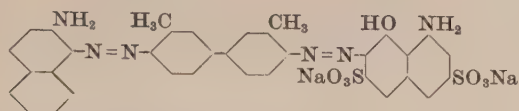
23540 Direct Dye

Discoverers — C. Duisberg and P. Ott 1891

**Diazo Brilliant Black R (By)**

Fastness Properties (C), developed with toluene-2,4-diamine:
Acid (organic) 4, Alkali 5, Light 3, Washing 3, Water 3–4
Dischargeability: neutral, fairly good; alkaline, poor–fair
Bayer Co., BP 22641/91; USP 523809; GP 65262 (Fr. 3, 769)

Soluble in water (orange brown) and ethanol (reddish orange)
 H_2SO_4 conc. — reddish blue; on dilution — violet
Aqueous solution + HCl conc. — violet, ppt;
+ NaOH conc. — orange brown, ppt.

23550 Direct Dye

o-Tolidine \rightarrow 2-Naphthylamine
(*alk.*) H acid

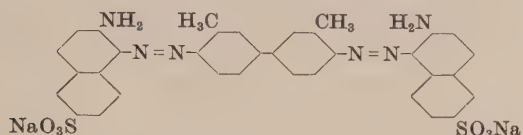
(Coupling may be done in either order)

Discoverer — C. Rudolph 1890

Naphthazurin B (Gr E)

Fastness Properties: Acid and Alkali, good; Light, moderate
Oehler, *BP* 10861/91; *USP* 462415; *GP* 70201 (*Fr.* 3, 692)

Soluble in water (bluish violet); insoluble in ethanol
 H_2SO_4 conc. — blue; on dilution — bluish violet ppt.
Aqueous solution + HCl — violet blue ppt;
+ NaOH — practically unchanged

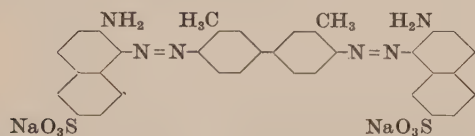
23560 C.I. Direct Red 21 (Yellowish red)

o-Tolidine \rightarrow Broenner's acid (2 mol.)

Discoverer — C. Duisberg 1885

Agfa, *GP* 35615 (*Fr.* 1, 473)
Bayer Co., *BP* 3803/85; *USP* 329633; *FP* 167876
Badische Co., *BP* 6697/95, 17260/95; *FP* 248210; *GP* 84893,
88597, (*Fr.* 4, 846, 854)
FIAT 764 — Benzopurpurin B

Moderately soluble in water (brownish orange) and ethanol
(reddish orange)
 H_2SO_4 conc. — blue; on dilution — pale corinth
Aqueous solution + HCl conc. — brown, ppt;
+ NaOH conc. — orange brown, ppt.

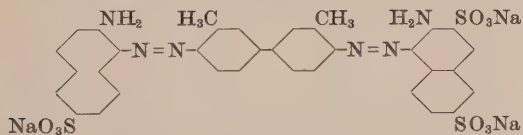
23565 C.I. Direct Red 22 (Bluish red)

o-Tolidine \rightarrow Broenner's acid
7-Amino-2-naphthalenesulfonic acid

Discoverers — F. Bayer and C. Duisberg 1886

Bayer Co., *BP* 5846/86; *USP* 363502; *FP* 180728; *GP* 42021
(*Fr.* 1, 479)
FIAT 764 — Deltapurpurin 5B
Bayer & Duisberg, *Ber.* 20 (1886), 1430
Weinberg, *Ber.* 20 (1887), 2910, 3353
Schultz, *Ber.* 20 (1887), 3160

Moderately soluble in water (brownish orange)
Slightly soluble in ethanol (reddish orange)
 H_2SO_4 conc. — blue; on dilution — brown
Aqueous solution + HCl conc. — brown, ppt;
+ NaOH conc. — brownish orange, ppt.

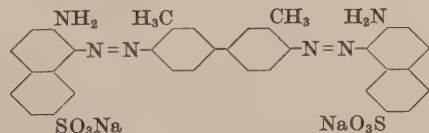
23570 C.I. Direct Red 34 (Red)

o-Tolidine \rightarrow (2) Broenner's acid
(1) 3-Amino-2,7-naphthalenedisulfonic acid

Discoverer — R. Krügener 1886

Agfa, *BP* 6687/87; *USP* 468539; *GP* 41095 (*Fr.* 1, 476)
FIAT 764 — Diaminpurpurin 3B
Lubs, *Ind. Eng. Chem.* 11 (1919), 456
Palkin & Evans, *JACS*, 47 (1925), 429

Soluble in water (reddish orange)
Slightly soluble in ethanol (pale reddish brown)
 H_2SO_4 conc. — deep blue; on dilution — corinth
Aqueous solution + HCl conc. — orange brown
+ NaOH conc. — reddish orange, ppt.

23580 Direct Dye

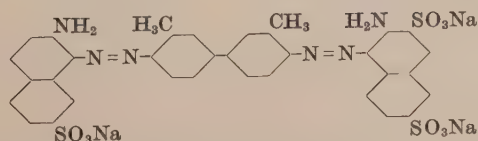
o-Tolidine \rightarrow 7-Amino-2-naphthalenesulfonic acid (2 mol.)

Discoverers — H. Hassenkamp and C. Duisberg 1886
A. Weinberg and H. Siebert 1886

Rosazurin G (By) was a mixture of this dye with C.I.23590
produced in situ
Bayer Co., *BP* 5846/86; *USP* 363502; *FP* 180728; *GP* 42021
(*Fr.* 1, 479)
Cassella Co., *BP* 12098/86; *USP* 375848; *FP* 178979; *GP* 48074
(*Fr.* 2, 381)

Soluble in water (reddish orange brown) and ethanol (red)
 H_2SO_4 conc. — blue; on dilution — pale brown

Aqueous solution + HCl conc. — brown, ppt;
+ NaOH conc. — red, ppt.

23585 Direct Dye

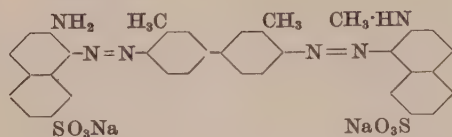
o-Tolidine \rightarrow 7-Amino-2-naphthalenesulfonic acid
3-Amino-2,7-naphthalenedisulfonic acid

Discoverer — R. Krügener 1887

Brilliant Congo 2R (A)

Agfa, *BP* 6687/87; *USP* 468539; *FP* 160722; *GP* 41095 (*Fr.* 1, 476)

Soluble in water (brownish red)
 H_2SO_4 conc. — blue; on dilution — brownish black ppt.
Aqueous solution + HCl — reddish brown ppt;
+ NaOH — soluble reddish yellow ppt.

23590**Direct Dye**

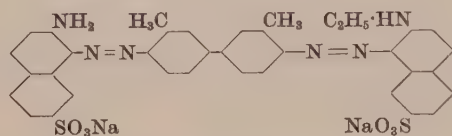
o-Tolidine \rightarrow 7-Amino-2-naphthalenesulfonic acid
 7-Methylamino-2-naphthalenesulfonic acid

Discoverer — H. Hassenkamp 1886

Rosazurine B (By)

Bayer Co., BP 17083/86; USP 381132, 381471; FP 180727;
 GP 41761 (Fr. 1, 480), GP 43169 (Fr. 2, 375)

Soluble in water (magenta red) and in ethanol (red)
 H_2SO_4 conc. — blue; on dilution — corinth
 Aqueous solution + HCl conc. — corinth, ppt;
 + NaOH conc. — magenta red, ppt.

23595**Direct Dye**

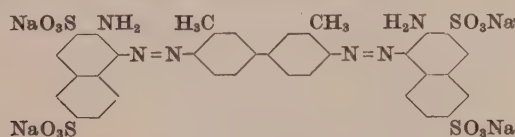
o-Tolidine \rightarrow 7-Amino-2-naphthalenesulfonic acid
 7-Ethylamino-2-naphthalenesulfonic acid

Discoverers — H. Hassenkamp and C. Duisberg 1886

Bayer Co., BP 17083/86; GP 41761, 43196, (Fr. 1, 480, 481),
 GP 43169 (Fr. 2, 375)

(The name **Rosazurine G (A) (By)** given under C.I. 1st edition
 No. 457, may have been incorrect, cf. C.I.23580. The
 following colour reactions given in C.I. 1st edition should
 therefore be accepted with reserve)

Soluble in water (cherry red)
 H_2SO_4 conc. — blue; on dilution — reddish violet ppt.
 Aqueous solution + HCl — reddish violet ppt.

23600**C.I. Direct Red 56 (Bright bluish red)**

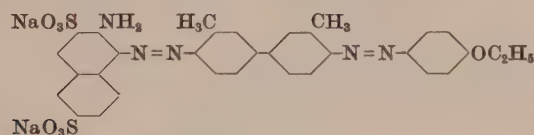
o-Tolidine \rightarrow 3-Amino-2,7-naphthalenedisulfonic acid (2 mol.)

(In some brands part of the 3-amino-2,7-naphthalenedisulfonic acid
 is replaced by Broenner's acid and a proportion of C.I.23570 is therefore
 present)

Discoverer — Cassella Co. 1901

FIAT 764 — Diaminbrillantscharlach S

Soluble in water (brownish orange to red)
 Slightly soluble in ethanol
 H_2SO_4 conc. — blue; on dilution — orange to reddish brown
 Aqueous solution + HCl conc. — orange brown, ppt;
 + NaOH conc. — brownish orange to red, ppt.

23605**C.I. Direct Orange 13 (Bright reddish orange)**

o-Tolidine \rightarrow (1) 3-Amino-2,7-naphthalenedisulfonic acid
 (2) Phenol

and ethylate the hydroxy group by heating under pressure with ethyl chloride

(In Diamine Orange F 10% of the 3-amino-2,7-naphthalenedisulfonic
 acid is replaced by Broenner's acid)

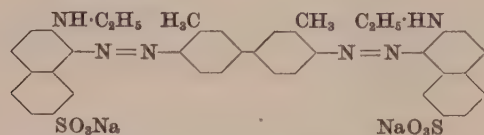
Discoverer — O. Borgmann 1889

Agfa, BP 6687/87, 17957/89; FP 160722; GP 41095 (Fr. 1, 476),
 GP 52328 (Fr. 2, 356)

BIOS 1548, 153

FIAT 764 — Diaminorange F

Soluble in water (orange to orange brown) and ethanol (golden
 orange)
 H_2SO_4 conc. — deep blue; on dilution — reddish grey brown,
 black ppt.
 Aqueous solution + HCl conc. — olive brown, ppt;
 + NaOH conc. — brownish orange, ppt.

23610**Direct Dye**

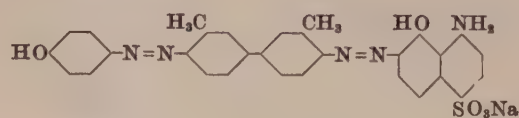
o-Tolidine \rightarrow 7-Ethylamino-2-naphthalenesulfonic acid (2 mol.)

Discoverer — H. Hassenkamp 1886

Bayer Co., BP 17083/86; USP 381132; GP 41761 (Fr. 1, 480)

(The name **Rosazurine B** given under C.I. 1st edition No. 458,
 may have been incorrect, cf. C.I.23590. The following
 colour reactions, quoted from the 1st edition, should therefore
 be treated with reserve)

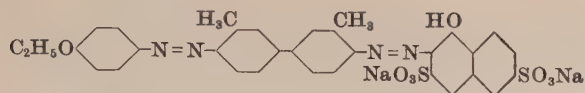
Soluble in water (cherry red)
 H_2SO_4 conc. — blue; on dilution — violet ppt.
 Aqueous solution + HCl — reddish violet ppt.
 + NaOH — soluble bluish red ppt.

23620**Direct Dye**

o-Tolidine \rightarrow Phenol
 (alk.) S acid

Discoverer — A. Blank

Para Green G (By)

23625 Direct Dye

o-Tolidine $\begin{cases} (2) \text{ Phenol} \\ (1) \text{ 1-Naphthol-3,6-disulfonic acid;} \end{cases}$

finally ethylate the (phenol) hydroxy group by heating under pressure with ethyl chloride

Discoverer — Cassella Co.

Diamine Bordeaux S (C)

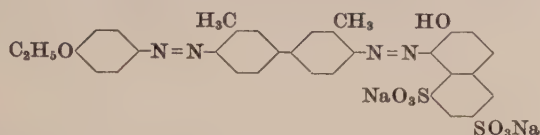
Fastness Properties (C): Acid (organic) 3, Alkali 4,
Light 2, 2, 3, Washing 1, Water 1
Dischargeability: neutral, good; alkaline, poor

Dyes of similar constitution —

Cassella Co., BP 12560/89; USP 426345; FP 200152; GP 54084
(Fr. 2, 384)

FIAT 764 — Diaminbordo S

Soluble in water (bordeaux) and ethanol (red)
H₂SO₄ conc. — blue; on dilution — pale dullish pink
Aqueous solution + HCl conc. — corinth, ppt;
+ NaOH conc. — reddish brown, ppt.

23630 C.I. Direct Red 39 (Bluish red)

o-Tolidine $\begin{cases} (2) \text{ Phenol} \\ (1) \text{ G acid;} \end{cases}$

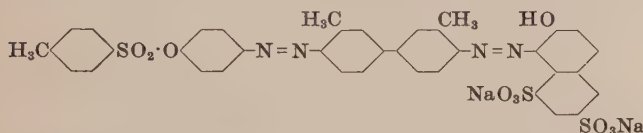
finally ethylate the (phenol) hydroxy group by heating under pressure with ethyl chloride

Discoverer — A. Weinberg 1889

Cassella Co., BP 12560/89; USP 426345; FP 200152; GP 54081
(Fr. 2, 384)

FIAT 764 — Diaminscharlach 3B

Soluble in water (bluish red)
Slightly soluble in ethanol and acetone
H₂SO₄ conc. — violet to reddish blue; on dilution — bordeaux
Aqueous solution + HCl conc. — corinth, ppt;
+ NaOH conc. — brownish orange, ppt.

23635 C.I. Acid Red 114 (Bright red)

o-Tolidine $\begin{cases} \text{Phenol} \\ \text{G acid;} \end{cases}$

finally esterify the (phenol) hydroxy group with p-toluenesulfonyl chloride

Rowe, RIC Lectures, 20

23640 C.I. Direct Yellow 2 (Yellow)

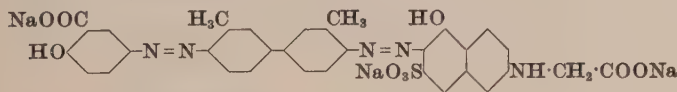
o-Tolidine \Rightarrow Salicylic acid (2 mol.)

Discoverer — E. Frank 1884

Bayer Co., BP 9162/84; USP 329638-9, 401024; FP 162880;
GP 31658 (Fr. 1, 465)

FIAT 764 — Chrysamin R

Soluble in water and ethanol (yellow)
H₂SO₄ conc. — reddish violet; on dilution — pale lemon yellow
Aqueous solution + HCl conc. — olive yellow, ppt.
+ NaOH conc. — orange, ppt.

23645 Direct Dye

o-Tolidine $\begin{cases} (1) \text{ Salicylic acid} \\ (2) \text{ (alk.) N-Carboxymethyl J acid} \end{cases}$

Aqueous solution + conc. — corinth, ppt;
+ NaOH conc. — reddish brown, ppt.

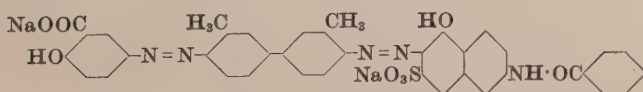
Discoverer — A. L. Laska 1902

Triazol Red 10B (By)

Fastness Properties (C): Acid (organic) 3, Alkali 4,
Light 3, Washing 3, Water 2-3

Oehler, BP 5792/03; USP 724893-4, 728477; GP 152679
(Fr. 7, 428)

Very soluble in water (magenta red)
Slightly soluble in ethanol (pink)
H₂SO₄ conc. — dark blue to navy blue; on dilution — reddish
brown to corinth

23650 Direct Dye

o-Tolidine $\begin{cases} \text{Salicylic acid} \\ \text{N-Benzoyl J acid} \end{cases}$

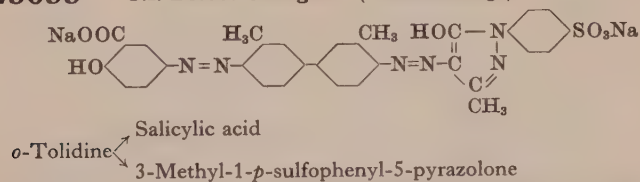
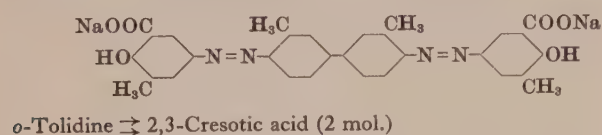
Discoverer — Oehler 1901

Toluylene Bordeaux B (Gr E)

Fastness Properties (C): Acid (organic) 2-3, Alkali 4,
Light 3, Washing 2, Water 2

Oehler, BP 10277/01; GP 152483 (Fr. 7, 447)

Soluble in water (wine red)
Moderately soluble in ethanol
H₂SO₄ conc. — deep blue; on dilution — corinth
Aqueous solution + HCl conc. — bordeaux, ppt;
+ NaOH conc. — bordeaux, ppt.

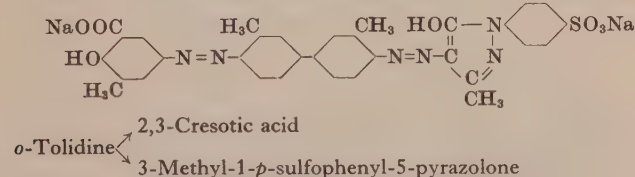
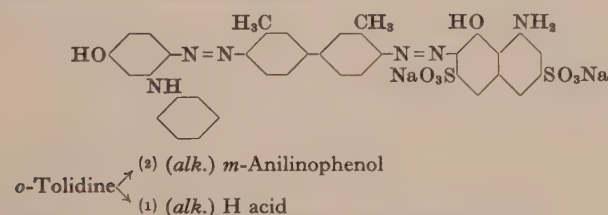
23655 C.I. Direct Orange 31 (Reddish orange)**23660 C.I. Direct Yellow 48 (Reddish yellow)**

Discoverers — C. Rudolph and B. Priebis 1888

Griesheim-Elektron, BP 7997/88; USP 394841, 396294; GP 47235 (Fr. 2, 353)

Soluble in water (golden yellow)

Moderately soluble in ethanol

H₂SO₄ conc. — violet; on dilution — yellowish oliveAqueous solution + HCl conc. — yellowish olive, ppt;
+ NaOH conc. — orange brown, ppt.**23665 C.I. Direct Orange 30 (Orange)****23675 C.I. Direct Black 30**

Discoverer — C. Rudolph 1891

Oehler, GP ap. 01527 (Fr. 4, 977)

FIAT 764 — Azoschwarzblau M

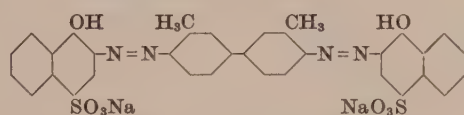
Soluble in water (violet black)

Slightly soluble in ethanol (reddish violet)

H₂SO₄ conc. — blue; on dilution — violet

Aqueous solution + HCl conc. — violet, ppt;

+ NaOH conc. — corinth, ppt.

23680 C.I. Direct Violet 39 (Reddish violet)

The following was recorded in the 1st Edition of the Colour Index —

“Under the name **Azo Blue (By)** this was the first blue azo dye placed upon the market; the first blue azo dyes prepared, however, were from tetrazotised *p*-phenylenediamine coupled with 2-naphthol-3,6-disulfonic acid (R acid) (Nietzki, Ber. 17 (1884), 344) and from benzidine, *o*-tolidine or *o*-diphenetidine coupled with R acid (Schultz, Ber. 17 (1884), 462)”

For the dye now known as Azo Blue see C.I.23685

Discoverer — C. Duisberg 1885

Bayer Co., BP 9510/85; USP 366078; FP 171133; GP 35341 (Fr. 1, 469)

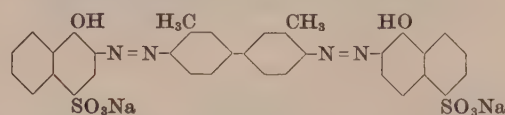
Knecht, JSDC, 1 (1885), 267

Soluble in water (violet)

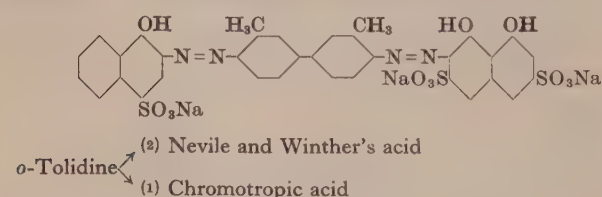
H₂SO₄ conc. — blue; on dilution — violet ppt.

Aqueous solution + HCl — violet ppt.

+ NaOH — magenta red

23685 C.I. Direct Violet 28 (Dull bluish violet)

FIAT 764 — Azoblau

23690 C.I. Direct Blue 31 (Reddish blue)

Discoverer — M.L.B. 1890

FIAT 764 — Dianilblau RR

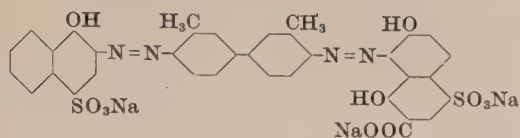
Soluble in water (deep violet)

Slightly soluble in ethanol (reddish violet)

H₂SO₄ conc. — greenish blue; on dilution — reddish violet

Aqueous solution + HCl conc. — deep violet

+ NaOH conc. — bordeaux

23695 Direct Dye

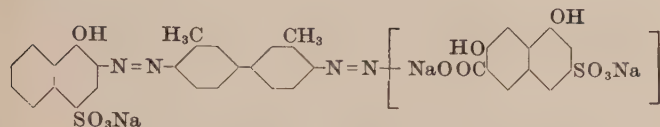
o-Tolidine \rightarrow Neville and Winther's acid
 \rightarrow 1,7-Dihydroxy-4-sulfo-2-naphthoic acid

Discoverer — C. O. Müller 1894

Indazurine RM (SCI)

Dyes cotton reddish blue
 Chem. Fabr. Bindschedler, *USP* 524070

Soluble in water (violet blue)
 Slightly soluble in ethanol (wine red)
 H_2SO_4 conc. — blue; on dilution — violet ppt.
 Aqueous solution + HCl — blue;
 + NaOH — red

23700 Direct Dye

o-Tolidine \rightarrow Neville and Winther's acid
 \rightarrow 3,5-Dihydroxy-7-sulfo-2-naphthoic acid

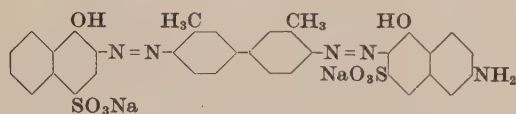
Discoverer — J. Schmid 1891

Direct Blue R (SCI)

Dyes cotton blackish-violet; Acid and alkali, good; Washing, moderate. Converted to black by aftertreatment with dichromate or copper sulfate

Ciba, *BP* 14253/92; *USP* 493564; *FP* 220468; *GP* 75258 (*Fr.* 3, 698)

Soluble in water (violet); insoluble in ethanol
 H_2SO_4 conc. — blue; on dilution — violet ppt.
 Aqueous solution + HCl conc. — violet ppt.
 + NaOH conc. — violet red

23705 C.I. Direct Blue 3 (Dull reddish blue)

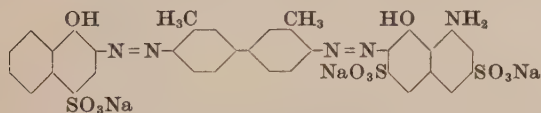
o-Tolidine \rightarrow (2) Neville and Winther's acid
 \rightarrow (1) (alk.) J acid

Discoverers — A. Bernthsen and P. Julius 1893

Badische Co., *BP* 2614/93; *USP* 521095; *FP* 227892; *GP* 93276 (*Fr.* 4, 860)

FIAT 764 — Benzoazurin 3R

Soluble in water (violet black)
 Slightly soluble in ethanol (reddish violet)
 H_2SO_4 conc. — greenish blue; on dilution — reddish violet, ppt.
 HNO_3 conc. — dull violet, turning to reddish violet
 Aqueous solution + HCl conc. — violet, ppt;
 + NaOH conc. — bordeaux, ppt.

23710 C.I. Direct Blue 21 (Blue \rightarrow Dull reddish blue)

o-Tolidine \rightarrow (2) Neville and Winther's acid
 \rightarrow (1) (alk.) H acid

In Benzo Blue BX the following mixed components are used —

0.75 mol. *o*-Tolidine \rightarrow (1) 0.754 mol. H acid
 0.25 mol. Benzidine \rightarrow (2) 1.046 mol. Neville and Winther's acid
 0.2 mol. 1-Naphthol-5-sulfonic acid

Discoverers — J. Bammann and M. Ulrich 1890
 M. Hoffmann 1890

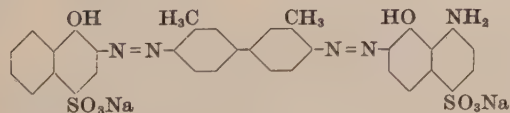
Cassella Co., *BP* 1742/91; *USP* 464135; *FP* 201770; *GP* 74593 (*Fr.* 3, 684)

Bayer Co., *BP* 13443/90; *USP* 498873; *FP* 210033

*BIO*S 1548, 172

FIAT 764 — Benzoblau BX

Benzo Blue BX —
 Soluble in water (navy blue)
 Slightly soluble in ethanol (pale violet) and Cellosolve;
 insoluble in other organic solvents
 H_2SO_4 conc. — blue; on dilution — reddish violet. HNO_3 conc. — blue, turns brown
 Aqueous solution + HCl conc. — violet, ppt;
 + NaOH conc. — wine red, ppt.

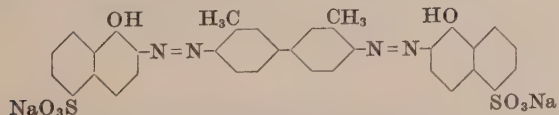
23715 Direct Dye

o-Tolidine \rightarrow Neville and Winther's acid
 \rightarrow (alk.) S acid

Discoverer — A. Blank 1907

Para Blue R (By)

Soluble in water (violet)
 Slightly soluble in ethanol (violet)
 H_2SO_4 conc. — deep blue; on dilution — reddish violet
 Aqueous solution + HCl conc. — bluish red, ppt;
 + NaOH conc. — wine red

23720 Direct Dye

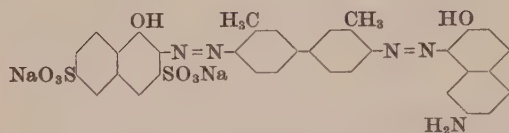
o-Tolidine \rightarrow 1-Naphthol-5-sulfonic acid (2 mol.)

Discoverer — C. Duisberg 1885

Benzo Azurine 4RT 67 (By)

Bayer Co., *BP* 9515/85; *USP* 366078; *FP* 171133; *GP* 35341 (*Fr.* 1, 469)

Soluble in water (violet black)
 Moderately soluble in ethanol (reddish violet)
 H_2SO_4 conc. — blue; on dilution — corinth
 Aqueous solution + HCl conc. — dullish violet, ppt;
 + NaOH conc. — magenta to wine red

23730 Direct Dye

o-Tolidine \nearrow 1-Naphthol-3,6-disulfonic acid
 \nwarrow 7-Amino-2-naphthol

Discoverers — J. Bammann and E. Davidis 1899

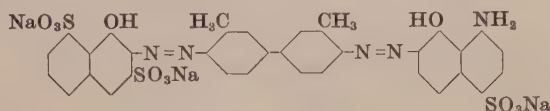
Brilliant Azurine 5R (By)

Fastness Properties (C): Acid (organic) 5, Alkali 4,
 Light 2, Washing 1-2, Water 2

Dischargeability: neutral, good; alkaline, fairly good

Bayer Co., BP 18872/99; USP 656619; FP 292982; GP 116872
 (Fr. 6, 944)

Soluble in water (reddish violet) and ethanol (reddish violet)
 H_2SO_4 conc. — blue; on dilution — reddish violet
 Aqueous solution + HCl conc. — reddish violet ppt;
 + NaOH conc. — violet red brown

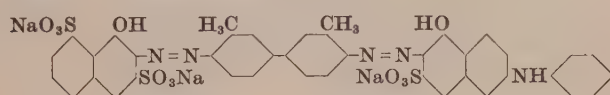
23740 Direct Dye

o-Tolidine \nearrow 1-Naphthol-3,8-disulfonic acid
 \nwarrow (alk.) S acid

Discoverer — M. Möller 1894

Columbia Blue G (A)

Soluble in water (blue); insoluble in ethanol
 H_2SO_4 conc. — greenish blue; on dilution — reddish violet, ppt.
 Aqueous solution + blue ppt;
 + NaOH — reddish violet ppt.

23745 Direct Dye

o-Tolidine \nearrow 1-Naphthol-3,8-disulfonic acid
 \nwarrow (alk.) *N*-Phenyl J acid

Discoverer — Agfa 1909

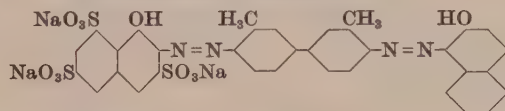
Brilliant Congo Blue RRW (A)

Fastness Properties (C): Acid (organic) 4, Alkali 4,
 Light 3, Washing 2, Water 1-2

Dischargeability: neutral, fair; alkaline, good

Griesheim-Elektron, USP 860220-1; GP 196924 (Fr. 9, 377)

Soluble in water (deep violet)
 Moderately soluble in ethanol (reddish violet)
 H_2SO_4 conc. — blue; on dilution — violet
 Aqueous solution + HCl conc. — violet blue, ppt;
 + NaOH conc. — violet, ppt.

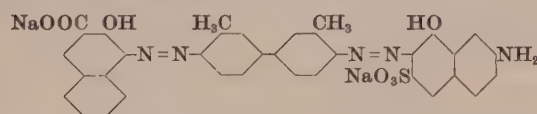
23750 C.I. Direct Blue 27 (Reddish blue)

o-Tolidine \nearrow 1-Naphthol-3,6,8-trisulfonic acid
 \nwarrow 2-Naphthol

Discoverer — M. Böniger 1896

Sandoz, BP 4703/97; USP 584981; FP 264279
 King, JCS (1932), 1268

Soluble in water (blue)
 Slightly soluble in ethanol
 H_2SO_4 conc. — blue; on dilution — reddish violet, ppt.

23760 Direct Dye

o-Tolidine \nearrow (2) 3-Hydroxy-2-naphthoic acid
 \nwarrow (1) (alk.) Gamma acid

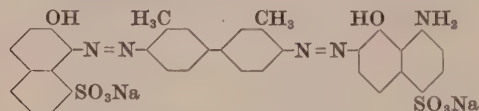
Discoverer — Agfa 1892

Zambesi Blue R (A)

Fastness Properties, developed with 2-naphthol (navy) or
 toluene-2,4-diamine (black): Acid and Alkali, good; Light,
 moderate

JSDC, 9 (1893), 78

Soluble in water (violet)
 H_2SO_4 conc. — blue; on dilution — blue ppt.
 Aqueous solution + HCl — blue ppt.
 + NaOH — redder, soluble ppt.

23770 Direct Dye

o-Tolidine \nearrow (1) Crocein acid
 \nwarrow (2) (alk.) S acid

Discoverers — C. Ris and E. Haager 1906

Chicago Blue RR (A)

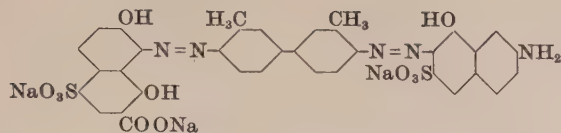
Fastness Properties (C): Acid (organic) 4, Alkali 4,
 Light 1, Washing 1-2, Water 2

Dischargeability: neutral and alkaline, fairly good

Jäger (Düsseldorf), BP 27609/07; USP 888036; FP 383747;
 GP 203535, 209269, (Fr. 9, 330, 331)
 FIAT 764 — Chicagoblau RR

Soluble in water (deep violet)
 Moderately soluble in ethanol (violet)
 H_2SO_4 conc. — blue; on dilution — violet

Aqueous solution + HCl conc. — dark navy blue, ppt;
 + NaOH conc. — bordeaux

23780 Direct Dye

o-Tolidine \rightarrow (1) 1,7-Dihydroxy-4-sulfo-2-naphthoic acid
(2) (alk.) Gamma acid

Discoverer — C. O. Müller 1894

Indazurine TS (SCI)

Reddish blue, converted to blue black on development with 2-naphthol

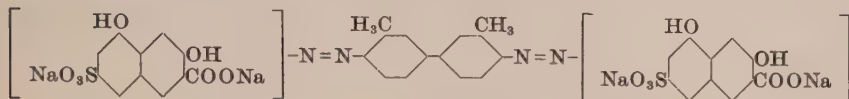
Chem. Fabr. Bindschedler, *USP* 524070

Soluble in water (violet blue)

Slightly soluble in ethanol

H₂SO₄ conc. — blue; on dilution — violet ppt.

Aqueous solution + HCl — redder;
+ NaOH — redder

23785 Direct Dye

o-Tolidine \rightarrow 3,5-Dihydroxy-7-sulfo-2-naphthoic acid (2 mol.)

Discoverer — J. Schmid 1891

Direct Grey (SCI)

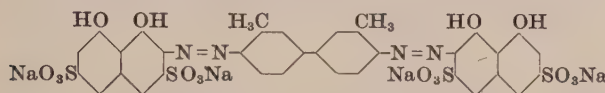
Fastness Properties: Acid and Alkali, good;
Light, moderate; Washing, good

Ciba, *BP* 14253/92; *USP* 493564; *FP* 220468;
GP 75258 (*Fr.* 3, 698)

Soluble in water (blue); insoluble in ethanol

H₂SO₄ conc. — bluish solution; on dilution — greyish blue

Aqueous solution + HCl — dark blue ppt;
+ NaOH — dark violet

23790 C.I. Direct Blue 25 (Blue)

o-Tolidine \rightarrow Chromotropic acid (2 mol.)

Aqueous solution + HCl conc. — reddish blue;
+ NaOH conc. — dark blue

Discoverer — H. Kuzel 1890

M.L.B., *BP* 9258/90; *USP* 458283; *GP* 69095 (*Fr.* 3, 588)

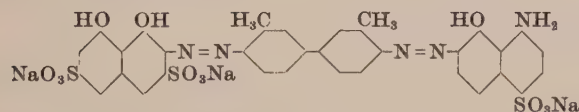
FIAT 764 — Dianilblau B

Soluble in water (blue)

Insoluble in organic solvents

H₂SO₄ conc. — greenish blue; on dilution — reddish blue to violet

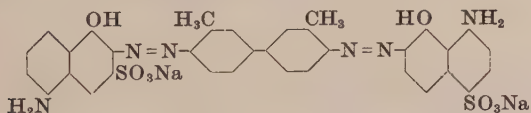
HNO₃ conc. — reddish solution, turns yellowish brown

23795 Direct Dye

o-Tolidine \rightarrow Chromotropic acid
(alk.) S acid

Columbia Blue 750 (A)

FIAT 764 — Columbiablau 750

23810 C.I. Direct Blue 60 (Reddish navy)

o-Tolidine \rightarrow (1) (alk.) M acid (5-Amino-1-naphthol-3-sulfonic acid)
(2) (alk.) S acid

Discoverers — A. Bernthsen and P. Julius 1893

Badische Co., *USP* 558344; *FP* 229263; *GP* 82572 (*Fr.* 4, 859)

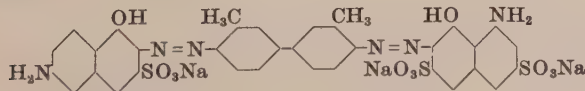
FIAT 764 — Oxaminblau BG

Soluble in water (navy blue)

Slightly soluble in ethanol (violet)

H₂SO₄ conc. — blue; on dilution — reddish violet

Aqueous solution + HCl conc. — deep violet, ppt;
+ NaOH conc. — deep violet, ppt.

23820 Direct Dye

o-Tolidine \rightarrow (2) (alk.) J acid
(1) (alk.) H acid

Discoverer — Badische Co. 1893

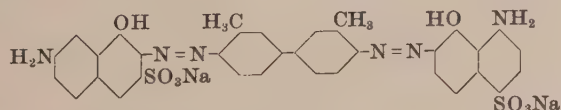
Benzo Navy Blue BM (By)

GP 93276 (*Fr.* 4, 860)

Soluble in water (deep violet); very slightly soluble in ethanol

H₂SO₄ conc. — blue; on dilution — violet

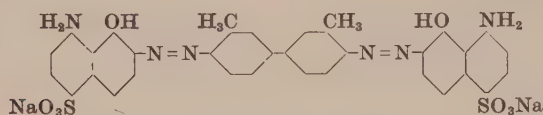
Aqueous solution + HCl conc. — dullish deep violet;
+ NaOH conc. — dullish deep violet

23825 Direct Dye

o-Tolidine \rightarrow (1) (alk.) Gamma acid
(2) (alk.) S acid

Zambesi Black R (IG)

FIAT 764 — Sambesischwarz R

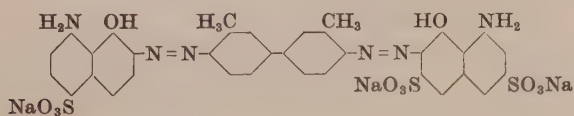
23830 C.I. Direct Blue 231 (Bright greenish blue)

o-Tolidine \rightleftharpoons (alk.) S acid (2 mol.)

Discoverers — J. Bammann and M. Ulrich 1893
M. Möller 1893

Bayer Co., USP 506284
Agfa, USP 509929
JSDC, 9 (1893), 127

Soluble in water (violet blue) and in ethanol (blue)
H₂SO₄ conc. — blue; on dilution — bluish violet
Aqueous solution + HCl — dark violet ppt; + NaOH — unaltered

23835 Direct Dye

(alk.) S acid
o-Tolidine \rightleftharpoons (alk.) H acid

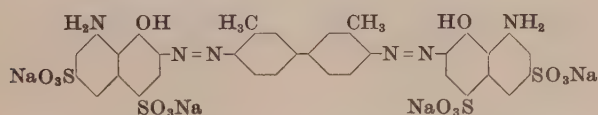
Discoverers — M. Ulrich and J. Bammann 1893

Benzo Cyanine B (By)

Fastness Properties: Acid, good; Alkali, poor; Light, poor.
The fastness is improved by aftertreatment with copper sulfate

Bayer Co., USP 533508, 578432; GP ap. F5667

Soluble in water (blue)
H₂SO₄ conc. — greenish blue; on dilution — reddish blue
Aqueous solution + HCl — soluble reddish blue ppt;
+ NaOH — soluble reddish blue ppt.

23840 Direct Dye

o-Tolidine \rightleftharpoons (alk.) B acid (8-Amino-1-naphthol-4,6-disulfonic acid) (2 mol.)

Discoverer — F. Bender 1895

Eboli Blue B (L)

Leonhardt BP 19253/95; USP 606436-7; FP 258853; GP ap. F8626 (Fr. 4, 567, 764)

Soluble in water (blue)
H₂SO₄ conc. — blue; on dilution — unaltered
Aqueous solution + HCl — soluble blue ppt.
+ NaOH — reddish violet

23850 C.I. Direct Blue 14 (Blue)

o-Tolidine \rightleftharpoons (alk.) H acid (2 mol.)

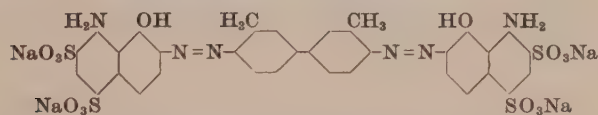
Discoverers — J. Bammann and M. Ulrich
M. Hoffmann 1890

Bayer Co., BP 13443/90; FP 210033
Cassella Co., BP 1742/91; USP 464135; FP 201770; GP 74593 (Fr. 3, 684)

Agfa, USP 521985; FP 229339
JSDC, 9 (1893), 15
Dale, JSCI, 43 (1924), 934

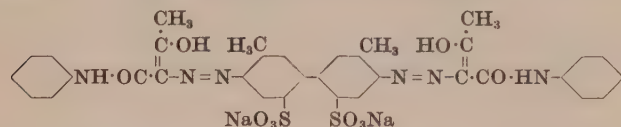
Soluble in water (blue)
Slightly soluble in Cellosolve
Insoluble in other organic solvents
H₂SO₄ conc. — dull greenish blue; on dilution — reddish blue
HNO₃ conc. — brownish grey solution

Aqueous solution + H₂SO₄ 10% — redder;
+ NaOH conc. — reddish violet

23860 C.I. Direct Blue 53 (Dull greenish blue)

o-Tolidine \rightleftharpoons (alk.) Chicago acid (2 mol.)

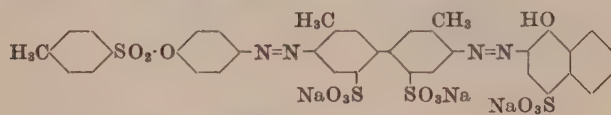
Soluble in water (bright blue)
H₂SO₄ conc. — bluish green; on dilution — pale yellow
Aqueous solution + HCl — bright blue
+ NaOH — violet to red

23900 C.I. Acid Yellow 44 (Greenish yellow)

6,6'-Disulfo-*o*-tolidine \rightleftharpoons Acetoacetanilide (2 mol.)

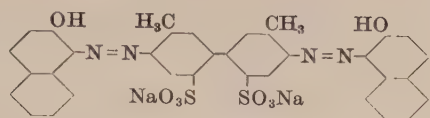
M.L.B., BP 17328/97; FP 269001; GP 99381 (Fr. 5, 60)
Etab. Kuhlmann, BP 456957; USP 2116355; GP 664183 (Fr. 25, 686)
BIOS 961, 68
FIAT 764 — Walkgelb H5G

Soluble in water (bright greenish yellow)
Slightly soluble in ethanol, acetone and Cellosolve
H₂SO conc. — dull yellow; on dilution — greenish yellow
HNO₃ conc. — reddish orange, turns to greenish yellow
Aqueous solution + HCl conc. — slightly redder

23905 C.I. Acid Red 145 (Bright yellowish red)

6,6'-Disulfo-*o*-tolidine \rightleftharpoons Phenol
Neville and Winther's acid;

then esterify the phenolic hydroxy group with *p*-toluenesulfonyl chloride

23910 C.I. Acid Red 89 (Red)

6,6'-Disulfo-*o*-tolidine \rightleftharpoons 2-Naphthol (2 mol.)

Aqueous solution + HCl conc. — magenta, ppt; + H₂SO₄ dil. — no change; + NaOH conc. — orange brown

Discoverer — Bayer Co. 1904

Similar dyes —

Bayer Co., *BP* 9139/05; *FP* 353816; *GP* 163141-2, 164990, (Fr. 8, 555, 556, 557)

BIOS 1548, 84. *FIAT* 764 — Saeureanthracenrot 3B

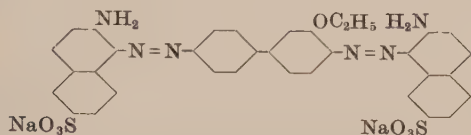
Soluble in hot water, slightly soluble cold (red)

Soluble in ethanol, acetone, Cellosolve and pyridine (orange red)

Insoluble in other organic solvents

H₂SO₄ conc. — reddish violet; on dilution — bluish red ppt.

HNO₃ conc. — dark red becoming orange

24000 Direct Dye

3-Ethoxybenzidine $\begin{cases} (1) \text{ Broenner's acid} \\ (2) \text{ 7-Amino-2-naphthalenesulfonic acid} \end{cases}$

Discoverer — A. Weinberg 1887

Diamine Red NO (C)

Cassella Co., *BP* 14464/87; *USP* 380067; *FP* 186566-7; *GP* 46134 (Fr. 2, 420)

Knecht, *JSDC*, 5 (1889) 171

Soluble in water (red)

Very slightly soluble in ethanol (red)

H₂SO₄ conc. — blue; on dilution — black ppt.

Aqueous solution + HCl — violet ppt;

+ NaOH — unaltered

24010 Direct Dye

3-Ethoxybenzidine $\begin{cases} (1) \text{ Salicylic acid} \\ (2) \text{ Phenol;} \end{cases}$

and ethylate the product

Discoverer — A. Weinberg 1887

Diamine Yellow N (C)

Cassella Co., *BP* 14464/87; *USP* 380067; *FP* 186566-7; *GP* 46134 (Fr. 2, 420)

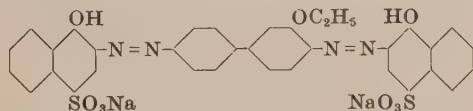
Knecht, *JSDC*, 5 (1889), 171

Slightly soluble in water; more soluble in ethanol

H₂SO₄ conc. — violet; on dilution — greenish brown ppt.

Aqueous solution + HCl — greenish ppt;

+ NaOH — soluble reddish yellow ppt.

24020 Direct Dye

3-Ethoxybenzidine \rightleftharpoons Nevile and Winther's acid (2 mol.)

Aqueous solution + HCl — reddish violet ppt;
+ NaOH — reddish violet

Discoverer — A. Weinberg 1887

Diamine Blue 3R (C)

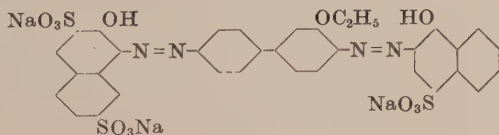
Cassella Co., *BP* 14464/87; *USP* 380067; *FP* 186566-7; *GP* 46134 (Fr. 2, 420)

Haller, *Koll. Z.* 29 (1921), 95

Soluble in water (reddish blue)

Slightly soluble in ethanol

H₂SO₄ conc. — dark blue; on dilution — violet ppt.

24025 Direct Dye

3-Ethoxybenzidine $\begin{cases} (1) \text{ 2-Naphthol-3,7-disulfonic acid} \\ (2) \text{ Nevile and Winther's acid} \end{cases}$

Discoverer — A. Weinberg 1887

Diamine Blue B (C)

Cassella Co., *BP* 14464/87; *USP* 380067; *FP* 186566-7; *GP* 46134 (Fr. 2, 420)

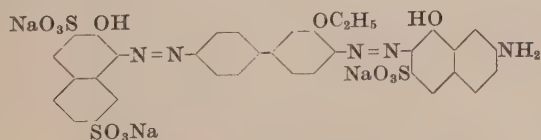
Soluble in water (blue)

Insoluble in ethanol

H₂SO₄ conc. — blue; on dilution — blue ppt.

Aqueous solution + HCl — blue ppt;

+ NaOH — reddish blue

24030 Direct Dye

3-Ethoxybenzidine $\begin{cases} (1) \text{ 2-Naphthol-3,7-disulfonic acid} \\ (2) \text{ (alk.) Gamma acid} \end{cases}$

Discoverer — L. Gans 1889

Diamine Blue Black E (C)

May be developed with 2-naphthol

Cassella Co., *BP* 14464/87; *USP* 380067; *FP* 186566-7; *GP* 46134 (Fr. 2, 420)

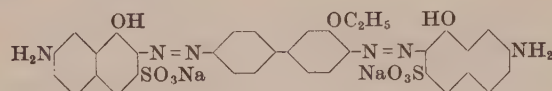
BP 16699/89; *FP* 201770; *GP* 55648 (Fr. 2, 397)

Soluble in water (blackish blue); insoluble in ethanol

H₂SO₄ conc. — blackish blue; on dilution — blue ppt.

Aqueous solution + HCl — blue ppt;

+ NaOH — unaltered

24040 Direct Dye

3-Ethoxybenzidine \rightarrow (alk.) Gamma acid (2 mol.)

Aqueous solution + HCl — blue ppt;
+ NaOH — unaltered

Discoverer — L. Gans. 1889

Diamine Black BO (C)

May be developed with toluene-2,4-diamine (black) or 2-naphthol (blue black)

Cassella Co., BP 16699/89; USP 442369; FP 201770;

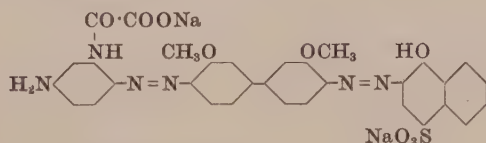
GP 55648 (Fr. 2, 397)

Kertész, Chem. Z. 15 (1891), 701

Soluble in water (blackish blue)

Slightly soluble in ethanol

H₂SO₄ conc. — blackish blue; on dilution — reddish blue ppt.

24050 Direct Dye

o-Dianisidine \rightarrow (1) *m*-Aminooxanilic acid
(2) Neville and Winther's acid

Discoverer — Markfeldt 1894

Oxamine Black BR (R)

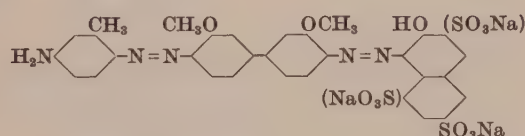
BP 22114/95; FP 252140

Soluble in water and ethanol

H₂SO₄ conc. — greenish blue; on dilution — bluish black ppt.

Aqueous solution + HCl — blackish blue ppt;

+ NaOH — magenta red

24060 Direct Dye

o-Dianisidine \rightarrow (2) *m*-Toluidine
(1) [0.77 mol. R acid]
[0.23 mol. G acid]

Discoverer — M. Kahn 1893

Diazo Blue 3R (By)

Fastness Properties (C), developed with 2-naphthol:

Light 2, Washing 2-3, Water 3-4

Dischargeability: neutral, fairly good; alkaline, good

Bayer Co., BP 9972/93; FP 231037; GP 79816 (Fr. 4, 941)

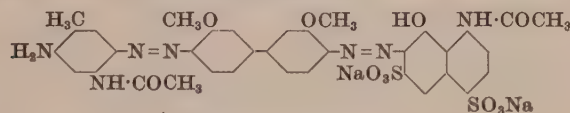
FIAT 764 — Diazoblau 3R

Soluble in water (bordeaux to corinth) and ethanol (bordeaux)

H₂SO₄ conc. — dark blue; on dilution — violet

Aqueous solution + HCl conc. — violet;

+ NaOH conc. — brown, ppt.

24065 C.I. Direct Blue 136 (Blue)*

o-Dianisidine \rightarrow (2) 3'-Amino-*p*-acetotoluidide
(1) *N*-Acetyl K acid

* Developed with 2-naphthol

Discoverers — H. Jordan and W. Neelmeier 1908

Bayer Co., BP 16092/08; USP 916323; FP 397613; GP 214352

(Fr. 9, 368)

FIAT 764 — Diazoreinblau B

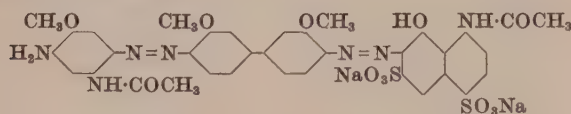
Soluble in water (reddish blue)

Very slightly soluble in ethanol

H₂SO₄ conc. — dull bluish violet; on dilution — blue ppt.

Aqueous solution + HCl conc. — violet black, ppt;

+ NaOH conc. — reddish brown, ppt; + NaOH 10% — reddish violet

24070 Direct Dye

o-Dianisidine \rightarrow (2) 3'-Amino-*p*-acetanisidide
(1) *N*-Acetyl K acid

Discoverers — H. Jordan and W. Neelmeier 1908

Diazo Sky Blue 3G (By)

Fastness Properties (C), developed with 2-naphthol:

Acid (organic) 3, Alkali 5, Light 1, 2, 2, Washing 3-4, Water 4

Dischargeability: neutral, very good; alkaline, good

Bayer Co., BP 16092/08; USP 916323; FP 397613; GP 214352

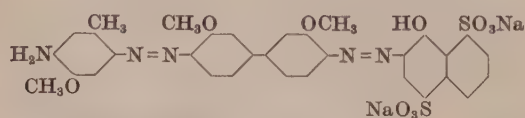
(Fr. 9, 368)

FIAT 764 — Diazoreinblau 3G

Soluble in water (navy blue);

Very slightly soluble in ethanol

H₂SO₄ conc. — violet black (+ blue); on dilution — corinth

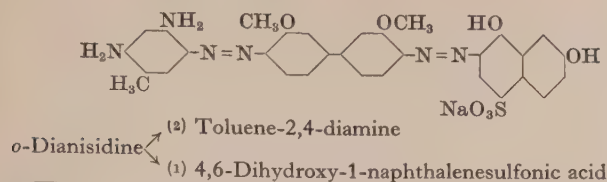
24075 Direct Dye

o-Dianisidine \rightarrow (2) Cresidine
(1) 1-Naphthol-4,8-disulfonic acid

Discoverer — M. Kahn 1893

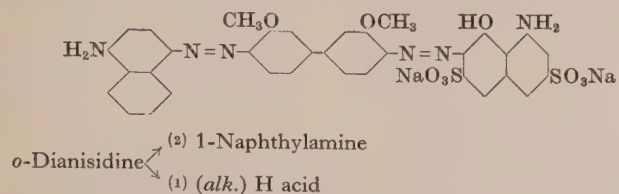
Diazo Blue (By)

Bayer Co., BP 9972/93; FP 231037; GP 79816 (Fr. 4, 941)

24080 C.I. Direct Violet 13 (Bluish violet)

Discoverer — C. O. Müller 1894
Chem. Fabr. Bindschedler, USP 524069

Soluble in water (violet) and ethanol (deep red)
H₂SO₄ conc. — blue; on dilution — blue ppt.
Aqueous solution + HCl — bluer
+ NaOH — red

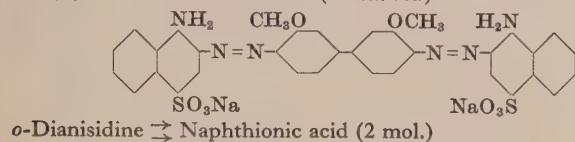
24090 Direct Dye

Discoverers — M. Ulrich and J. Bammann (Bayer Co.) 1897

Diazo Black 3B (By)

Fastness Properties, developed with 2-naphthol or *m*-phenylenediamine: Acid (organic) and Ammonia, good; Light, moderate; Washing, good

Soluble in water (violet) and ethanol (violet)
H₂SO₄ conc. — blue; on dilution — violet
Aqueous solution + HCl conc. — bluish violet;
+ NaOH conc. — corinth

24100 C.I. Direct Red 7 (Bluish red)

Discoverer — C. Duisberg 1885

Bayer Co., BP 14424/85; USP 481934; FP 173042; GP 38802 (Fr. 1, 488)

Badische Co., BP 6697/95; 17260/95; FP 248210; GP 84893, 88597, (Fr. 4, 846, 854)

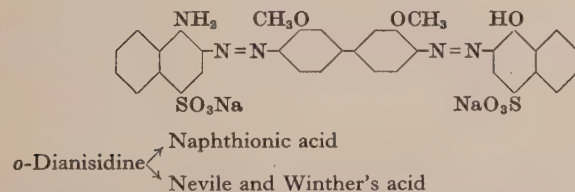
BIOS 1548, 166

FIAT 764 — Benzopurpurin 10B

Zsigmondy, Z. phys. Chem. **111** (1924), 211

Aqueous solution + HCl conc. — blue, ppt;
+ NaOH conc. — red, ppt.

Soluble in water (red) and in ethanol (reddish orange)
H₂SO₄ conc. — blue; on dilution — pale blue

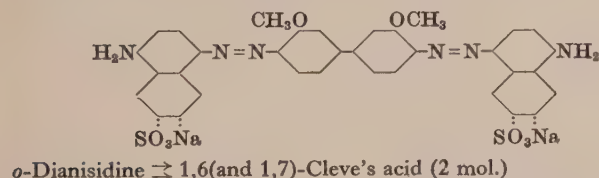
24105 C.I. Direct Violet 32 (Bluish violet)

Discoverer — C. Duisberg 1886

Azo Violet (By)

Bayer Co., BP 14424/85, 7283/86; USP 447302; FP 173042; GP 40247 (Fr. 1, 491)

Soluble in water (reddish violet) and ethanol (magenta red)
H₂SO₄ conc. — blue; on dilution — reddish blue
Aqueous solution + HCl conc. — reddish blue
+ NaOH conc. — wine red

24110 C.I. Direct Black 87 (Bluish black)*

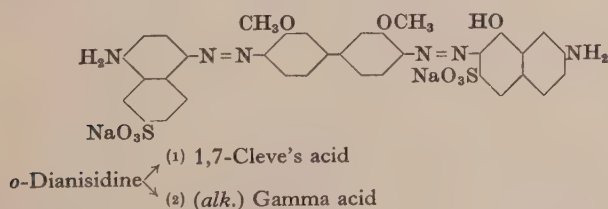
* Developed with 2-naphthol

Discoverers — C. Duisberg and P. Ott 1891

Bayer Co., BP 22641/91; USP 523809; GP 65262 (Fr. 3, 769)

FIAT 764 — Diazobrillantschwarz B

Soluble in water (reddish orange brown) and ethanol (red)
H₂SO₄ conc. — bluish violet; on dilution — blue
Aqueous solution + HCl conc. — deep blue, ppt;
+ NaOH conc. — reddish brown, ppt.

24115 C.I. Direct Black 86 (Bluish black)*

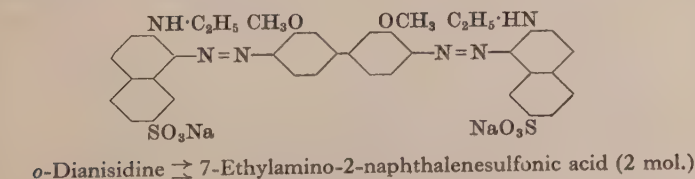
* Developed with 2-naphthol

Discoverer — P. Ott 1891

Bayer Co., GP 75411 (Fr. 3, 669)

FIAT 764 — Diazoechtschwarz B 50:100

Soluble in water (violet black) and ethanol (bordeaux to corinth)
H₂SO₄ conc. — deep blue; on dilution — violet
Aqueous solution + HCl conc. — dark blue, ppt;
+ NaOH conc. — corinth, ppt.

24120 Direct Dye

Discoverers — H. Hassenkamp and C. Duisberg 1887

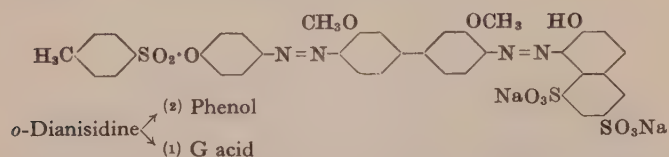
Heliotrope B (By)

Fastness to light and washing increased by aftertreatment with copper sulfate

Bayer Co., BP 17083/86; GP 43204 (Fr. 2, 377)

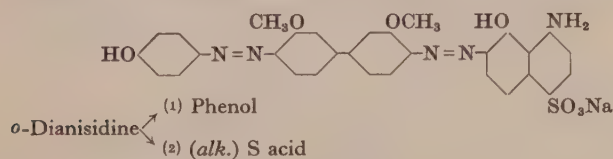
Soluble in water (magenta red)
H₂SO₄ conc. — blue; on dilution — bluish violet ppt.
Acetic acid (dilute) — reddish violet solution
Aqueous solution + HCl — violet ppt;
+ NaOH — scarcely altered — or soluble crimson red ppt.

24125 C.I. Acid Red 128 (Yellowish red)



then esterify the phenolic hydroxy group with p-toluenesulfonyl chloride

24130 C.I. Direct Green 57 (Green)*

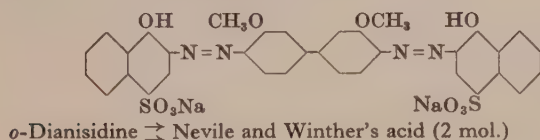


* Coupled with diazotised p-nitroaniline

Discoverer — M. Kahn
FIAT 764 — Paragruen B

Soluble in water (corinth)
Very soluble in ethanol (violet)
H₂SO₄ conc. — dark blue; on dilution — pale greyish violet
Aqueous solution + HCl conc. — hue unchanged, dye ppt;
+ NaOH conc. — unchanged

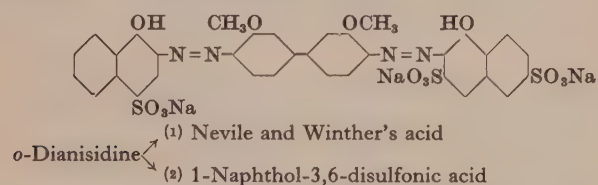
24140 C.I. Direct Blue 8 (Blue)



Discoverer — C. Duisberg 1885
Bayer Co., BP 14424/85; USP 357273, 481934; FP 173042;
GP 38802 (Fr. 1, 488)
BIOS 1548, 171
FIAT 764 — Benzoazurin G
Knecht, JSDC, 2 (1886), 113

Soluble in water (violet to reddish blue) and Cellosolve
Very slightly soluble in ethanol
Insoluble in other organic solvents
H₂SO₄ conc. — blue; on dilution — reddish blue
Aqueous solution + HCl conc. — violet, ppt;
+ NaOH conc. — reddish violet

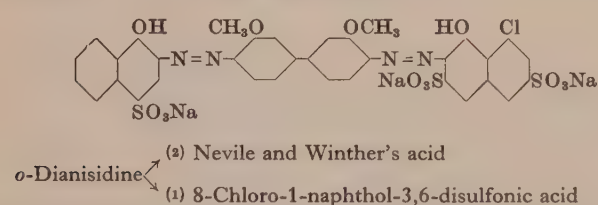
24145 C.I. Direct Blue 35 (Blue)



Discoverer — C. Duisberg 1886
Bayer Co., BP 14424/85; USP 447302, 467162, 476371;
FP 173042; GP 40247 (Fr. 1, 491)
FIAT 764 — Brillantazurin B

Soluble in water (deep violet)
Very slightly soluble in ethanol
H₂SO₄ conc. — turquoise blue; on dilution — violet
Aqueous solution + HCl conc. — violet, ppt;
+ NaOH conc. — magenta red

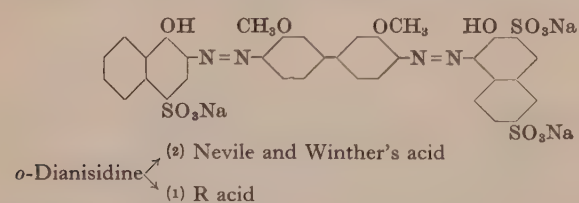
24150 C.I. Direct Blue 36 (Blue)



Discoverer — A. Weinberg 1893
Cassella Co., BP 1920/94; USP 532125; FP 235271; GP 79055,
82285, (Fr. 4, 526, 865)
FIAT 764 — Diaminbrillantblau G

Soluble in water (violet)
Slightly soluble in ethanol
H₂SO₄ conc. — bluish green (+ violet); on dilution — reddish violet
Aqueous solution + HCl conc. — violet, ppt;
+ NaOH conc. — reddish violet

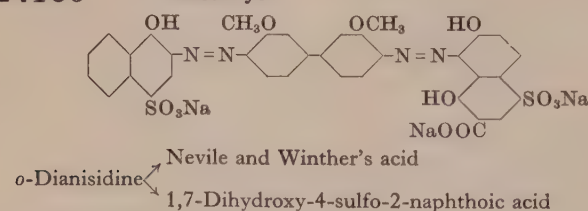
24155 C.I. Direct Blue 9 (Blue)



Discoverer — M.L.B.
Bayer Co., BP 14424/85, 7283/86; USP 467162; FP 173042;
GP 40247 (Fr. 1, 491)
Paul, Z. angew. Chem. 9 (1896), 559

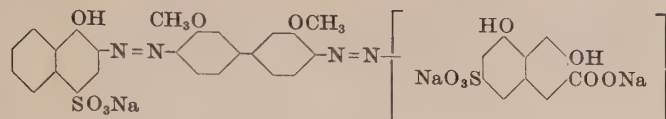
Soluble in water (blue); insoluble in ethanol
H₂SO₄ conc. — blue; on dilution — blue ppt.
Aqueous solution + HCl — dark blue ppt;
+ NaOH — magenta red

24160 Direct Dye



Discoverer — C. O. Müller 1894
Indazurine GM (Ciba)
Chem. Fabr. Bindschedler, USP 524070

Soluble in water (reddish blue)
Slightly soluble in ethanol (bluish violet)
H₂SO₄ conc. — greenish blue; on dilution — violet ppt.
Aqueous solution + HCl — unaltered
+ NaOH — reddish violet

24165 Direct Dye

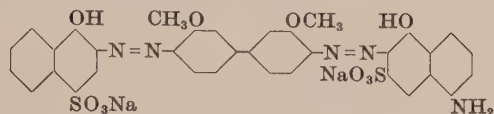
o-Dianisidine \swarrow Neville and Winther's acid
 \searrow 3,5-Dihydroxy-7-sulfo-2-naphthoic acid

Discoverers — J. Schmid and R. Paganini 1892

Direct Blue B (Ciba)

Ciba, *BP* 14161/92; *USP* 493562-3; *FP* 219875, 220468;
GP 67000, 75258, (*Fr.* 3, 505, 698)
 Schmid, *Ber.* 26 (1893), 1114

Soluble in water (bluish red)
 Slightly soluble in ethanol
 H₂SO₄ conc. — greenish blue; on dilution — violet ppt.
 Aqueous solution + HCl — blackish blue ppt;
 + NaOH — reddish violet

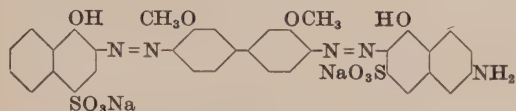
24170 C.I. Direct Blue 12 (Blue)

o-Dianisidine \swarrow (2) Neville and Winther's acid
 \searrow (1) (alk.) M acid (5-Amino-1-naphthol-3-sulfonic acid)

Discoverers — A. Bernthsen and P. Julius 1893

Badische Co., *USP* 558344; *FP* 229263; *GP* 82572 (*Fr.* 4, 859)
FIAT 764 — Oxaminblau B

Soluble in water (violet to reddish blue)
 H₂SO₄ conc. — greenish blue; on dilution — reddish violet
 HNO₃ conc. — yellow
 Aqueous solution + HCl conc. — bluish violet;
 + NaOH conc. — bordeaux to reddish violet

24175 C.I. Direct Blue 151 (Reddish blue)*

Dianisidine \swarrow (1) Neville and Winther's acid
 \searrow (2) (alk.) J acid

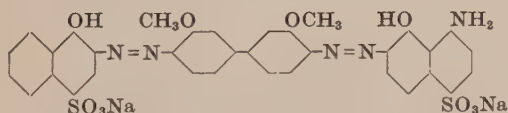
In some brands the proportions of the coupling components are disbalanced so that the product is a mixture with C.I.24140 or with the symmetrical dye from J acid

* Aftertreated with copper sulfate

Discoverer — Badische Co. 1893

GP 93276 (*Fr.* 4, 860)
FIAT 764 — Benzokupferblau B, BC

Soluble in water (B — bluish violet) (BC — violet)
 Moderately soluble in ethanol (B and BC reddish violet)
 H₂SO₄ conc. — (B) — turquoise, (BC) — bluish green;
 on dilution — violet
 Aqueous solution + HCl conc. — violet (ppt.);
 + NaOH conc. — (B) reddish violet to wine red, (BC) wine red

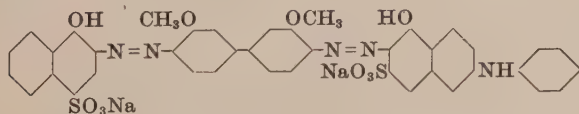
24180 Direct Dye

o-Dianisidine \swarrow (2) Neville and Winther's acid
 \searrow (1) (alk.) S acid

Discoverer — A. Blank 1907

Para Blue G (By)

Moderately soluble in water and ethanol (violet)
 H₂SO₄ conc. — deep blue; on dilution — reddish violet
 Aqueous solution + HCl conc. — hue unchanged, ppt;
 + NaOH conc. — unchanged

24185 C.I. Direct Blue 168 (Reddish blue)*

o-Dianisidine \swarrow (1) Neville and Winther's acid
 \searrow (2) (alk.) N-Phenyl J acid

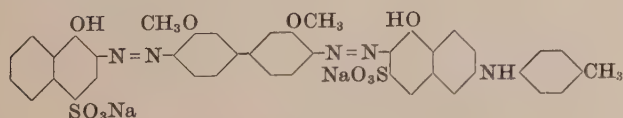
In some brands the proportions of the coupling components are disbalanced so that the product is a mixture with C.I.24140

* Aftertreated with copper sulfate

Discoverer — Bayer Co. 1905

FIAT 764 — Benzokupferblau BB

Soluble in water (deep violet)
 Moderately soluble in ethanol (reddish violet)
 H₂SO₄ conc. — turquoise; on dilution — violet
 Aqueous solution + HCl conc. — violet, ppt;
 + NaOH conc. — wine red

24190 Direct Dye

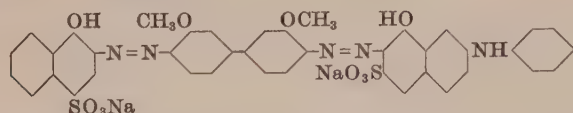
o-Dianisidine \swarrow Neville and Winther's acid
 \searrow N-*p*-Tolyl J acid

Discoverer — M. Ulrich (Bayer Co.) 1895

Brilliant Azurine R (By)

Fastness Properties (C): Acid (organic) 3-4, Alkali 3,
 Light 2, Washing 1-2, Water 2-3
 Dischargeability: neutral, poor; alkaline, fairly good

Soluble in water and ethanol (violet)
 H₂SO₄ conc. — greenish blue; on dilution — violet
 Aqueous solution + HCl conc. — reddish blue ppt.
 + NaOH conc. — dullish violet

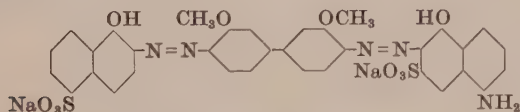
24195 Direct Dye

o-Dianisidine $\begin{cases} (1) \text{ Nevile and Winther's acid} \\ (2) \text{ (alk.) } N\text{-Phenyl Gamma acid} \end{cases}$

Discoverer — A. Weinberg 1894

Diamine New Blue R (C)

Cassella Co., *BP* 11157/94; *USP* 535036; *FP* 239509; *GP* 84859
(*Fr.* 4, 868)

24200 Direct Dye

o-Dianisidine $\begin{cases} (2) \text{ 1-Naphthol-5-sulfonic acid} \\ (1) \text{ (alk.) M acid (5-Amino-1-naphthol-3-sulfonic acid)} \end{cases}$

Discoverers — A. Bernthsen and P. Julius 1893

Oxamine Blue GN (B)

Fastness Properties (C): Acid (organic) 3-4, Light 2, Washing 2-3, Water 3

Badische Co., *USP* 558344; *FP* 229263; *GP* 82572 (*Fr.* 4, 859)

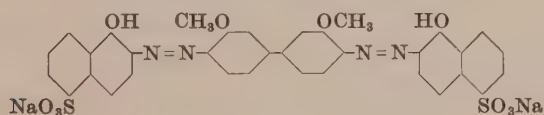
Soluble in water (dark navy blue)

Moderately soluble in ethanol

H_2SO_4 conc. — turquoise blue; on dilution — reddish violet

Aqueous solution + HCl conc. — violet, ppt;

+ NaOH conc. — reddish violet

24205 C.I. Direct Blue 50 (Blue)

o-Dianisidine \rightleftharpoons 1-Naphthol-5-sulfonic acid (2 mol.)

Discoverer — C. Duisberg 1885

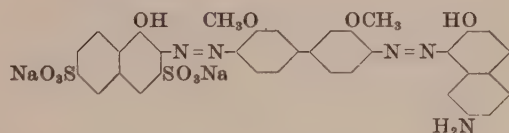
Bayer Co., *BP* 14424/85; *USP* 357273, 481934; *FP* 173042; *GP* 38802 (*Fr.* 1, 488)

Soluble in water (reddish violet) and ethanol (violet)

H_2SO_4 conc. — blue; on dilution — reddish violet

Aqueous solution + HCl conc. — dull reddish violet, ppt;

+ NaOH conc. — reddish violet

24210 Direct Dye

o-Dianisidine $\begin{cases} (1) \text{ 1-Naphthol-3,6-disulfonic acid} \\ (2) \text{ 7-Amino-2-naphthol} \end{cases}$

Discoverers — J. Bammann and E. Davidis 1899

Brilliant Azurine RR (By)

Fastness Properties (C): Acid (organic) 5, Alkali 4, Light 2, Washing 1-2, Water 2

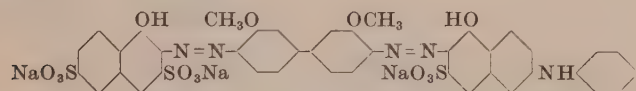
Bayer Co., *BP* 18872/99; *USP* 656619; *FP* 292982; *GP* 116872
(*Fr.* 6, 944)

Soluble in water (violet) and ethanol

H_2SO_4 conc. — turquoise blue; on dilution — reddish violet

Aqueous solution + HCl conc. — reddish violet, ppt;

+ NaOH conc. — wine red, ppt.

24215 Direct Dye

o-Dianisidine $\begin{cases} (1) \text{ 1-Naphthol-3,6-disulfonic acid} \\ (2) \text{ (alk.) } N\text{-Phenyl J acid} \end{cases}$

H_2SO_4 conc. — turquoise; on dilution — violet
Aqueous solution + HCl conc. — deep violet, ppt;
+ NaOH conc. — bordeaux

Discoverer — A. L. Laska 1906

Triazol Pure Blue R (Gr E)

Fastness Properties (C): Acid (organic) 4, Alkali 4-5, Light 2, Washing 1-2, Water 2

Dischargeability: neutral, fairly good — good; alkaline, good — very good

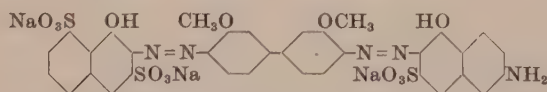
For dyes of similar constitution see —

Griesheim-Elektron, *USP* 860220-1; *GP* 196924, 200054,
(*Fr.* 9, 377, 378)

FIAT 764 — Triazolreinblau R

Soluble in water (deep violet)

Slightly soluble in ethanol (reddish violet)

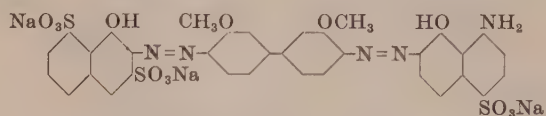
24220 C.I. Direct Blue 65 (Reddish blue)

o-Dianisidine $\begin{cases} 1\text{-Naphthol-3,8-disulfonic acid} \\ \text{(alk.) J acid} \end{cases}$

Soluble in water and ethanol

Slightly soluble in acetone

H_2SO_4 conc. — bluish green; HCl conc. — violet to blue

24225 Direct Dye

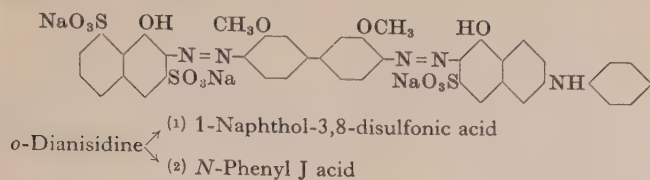
o-Dianisidine $\begin{cases} (1) \text{ 1-Naphthol-3,8-disulfonic acid} \\ (2) \text{ (alk.) S acid} \end{cases}$

Oxamine Blue 3B (IG)

Fastness Properties (C): Acid (organic) 4-5, Alkali 5, Light 2, Washing 1-2, Water 1

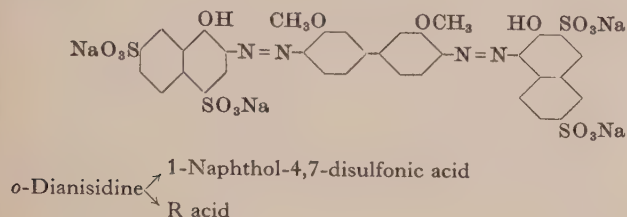
Dischargeability: neutral and alkaline, good — very good

FIAT 764 — Oxaminblau 3B

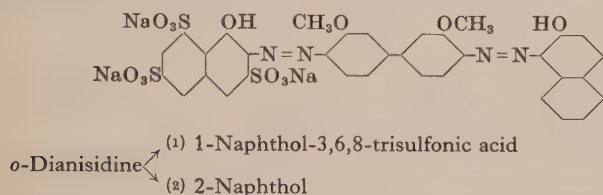
24230 Direct Dye*Discoverer* — A. L. Laska 1906**Brilliant Copper Blue BW40**

Fastness Properties (C), direct: Acid (organic) 4,
Alkali 4, Light 1, 2, 3, Washing 1-2, Water 2
Dischargeability: neutral, fair; alkaline, good

Griesheim-Elektron, USP 860220-1; GP 196924 (*Fr.* 9, 377)
FIAT 764 — Brillantkupferblau BW

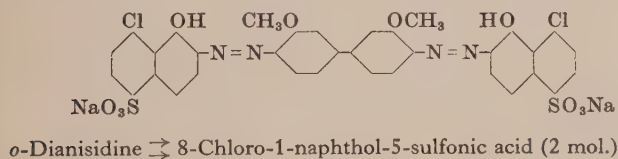
24240 Direct Dye*Discoverers* — Read, Holliday and Sons, 1907**Titan Blue 3B (H)**

Compare BP 2568/07

24250 Direct Dye*Discoverer* — M. Böniger 1896**Trisulfon Blue B (S)**

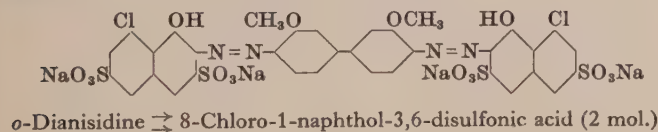
Washing fastness improved by aftertreatment with dichromate
Sandoz, BP 4703/97; USP 584981; FP 264279

Soluble in water (blue)
Slightly soluble in ethanol
H₂SO₄ conc. — greenish blue; on dilution — blue ppt.
Aqueous solution + HCl — blue ppt;
+ NaOH — reddish violet

24260 Direct Dye*Discoverers* — J. Turner and H. Dean 1898

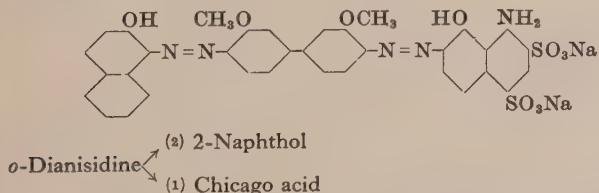
Under C.I.510 (1st Edition) this constitution was associated with
the dyes **Chlorazol Brilliant Blue 8B, 10B, 12B and R(H)**
Read, Holliday & Sons, BP 12085/98

Soluble in water (violet); insoluble in ethanol
H₂SO₄ conc. — greenish blue; on dilution — violet ppt.
Aqueous solution + HCl — violet ppt;
+ NaOH — crimson

24270 C.I. Direct Blue 37 (Bright blue)*Discoverer* — A. Weinberg 1893

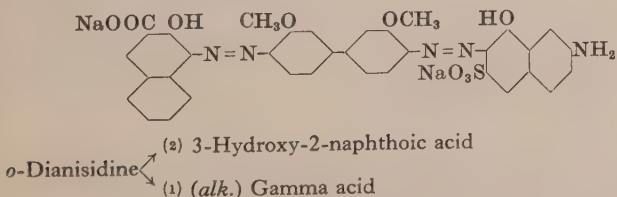
Cassella Co., BP 1920/94; USP 532125; FP 235271; GP 79055,
82285, (*Fr.* 4, 526, 865)
JSDC, 12 (1896), 18

Soluble in water (bluish violet); insoluble in ethanol
H₂SO₄ conc. — greenish blue; on dilution — violet
Aqueous solution + HCl — soluble reddish violet ppt;
+ NaOH — cherry red

24280 C.I. Direct Blue 22 (Blue)*Discoverer* — M. Möller 1894

FIAT 764 — Chicagoblau RW
JSDC, 11 (1895), 75

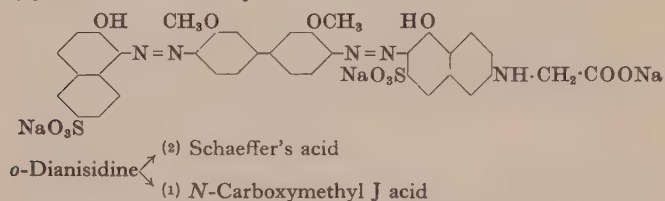
Soluble in water (blue) and Cellosolve
Insoluble in other organic solvents
H₂SO₄ conc. — greenish blue; on dilution — violet ppt.
HNO₃ conc. — brownish grey solution
Aqueous solution + HCl dil. — bluish red;
+ NaOH — violet

24290 Direct Dye*Discoverer* — Agfa 1892**Zambesi Blue B (A)**

Fastness Properties, developed with 2-naphthol: Acid, Alkali,
Light and Washing, moderate.

JSDC, 9 (1893), 78

Soluble in water (blue)
H₂SO₄ conc. — bluish green; on dilution — blue ppt.
Aqueous solution + HCl — blue ppt;
+ NaOH — redder

24300 Direct Dye

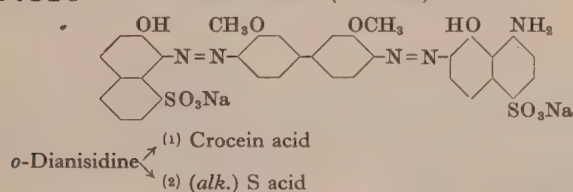
Aqueous solution + HCl conc. — violet, ppt;
+ NaOH conc. — reddish violet

Discoverer — A. L. Laska 1902

Triazol Blue R (Gr E)

Fastness Properties (C): Acid (organic) 4, Alkali 4–5
Light 2, Washing 1–2, Water 2
Dischargeability: neutral, poor — fair; alkaline, fairly good
Oehler, *BP* 5792/03; *USP* 724893–4, 728477; *GP* 152679
(*Fr.* 7, 428)

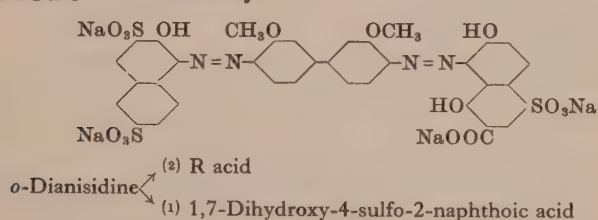
Soluble in water (bluish violet)
Slightly soluble in ethanol (pink)
 H_2SO_4 conc. — greenish blue; on dilution — violet

24310 C.I. Direct Blue 45 (Dull blue)

Discoverers — C. Ris and E. Haager 1906

C. Jäger & Co., *BP* 27609/07; *USP* 888036; *FP* 383747; *GP* 203535 (*Fr.* 9, 330)
FIAT 764 — Benzoviskoseblau BB

Soluble in water (dark navy blue) and ethanol (violet)
 H_2SO_4 conc. — greenish blue; on dilution — reddish blue
Aqueous solution + HCl conc. — deep blue;
+ NaOH conc. — violet

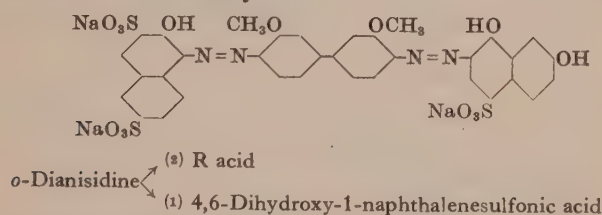
24320 Direct Dye

Discoverer — C. O. Müller 1894

Indazurine BB (Ciba)

Chem. Fabr. Bindschedler, *USP* 524070
Friedländer & Zinberg, *Ber.* 29 (1896), 38

Soluble in water (reddish blue)
Slightly soluble in ethanol
 H_2SO_4 conc. — greenish blue; on dilution — blue ppt.
Aqueous solution + HCl — rather bluer;
+ NaOH — red

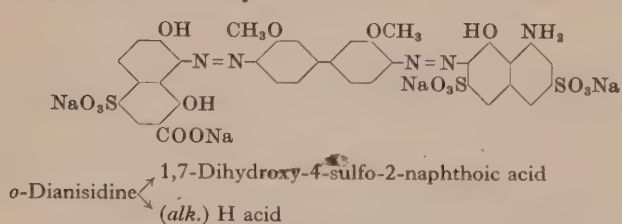
24325 Direct Dye

Discoverer — C. O. Müller 1894

Indazurine B (Ciba)

Chem. Fabr. Bindschedler, *USP* 524069

Soluble in water (reddish blue); very slightly soluble in ethanol
 H_2SO_4 conc. — greenish blue; on dilution — reddish blue ppt.
Aqueous solution + HCl — bluer;
+ NaOH — red

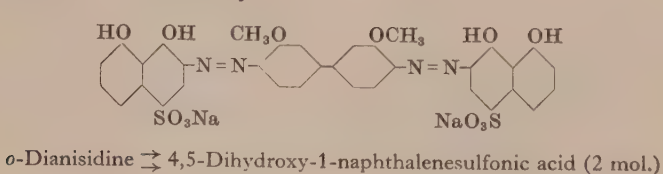
24330 Direct Dye

Discoverer — C. O. Müller 1894

Indazurine 5GM (Ciba)

Chem. Fabr. Bindschedler, *USP* 524070
Friedländer & Zinberg, *Ber.* 29 (1896), 38

Soluble in water (blue); insoluble in ethanol
 H_2SO_4 conc. — bluish green; on dilution — bluish violet
Aqueous solution + HCl — unaltered
+ NaOH — redder

24335 Direct Dye

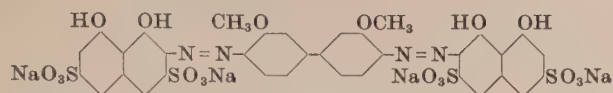
Discoverer — M. Ulrich 1889

Brilliant Azurine 5G (By)

Fastness Properties (C): Acid (organic) 5, Alkali 1–2,
Light 2, 3, 4, Washing 1–2, Water 3. Light fastness
much improved by aftertreatment with copper sulfate
Dischargeability: neutral and alkaline, good — very good
Bayer Co., *BP* 13665/89; *USP* 417294; *FP* 173042; *GP* 57166
(*Fr.* 3, 660)
FIAT 764 — Brillantazurin 5G

Aqueous solution + HCl conc. — violet, ppt;
+ NaOH conc. — reddish violet

Soluble in water (navy blue)
Very slightly soluble in ethanol (pale blue)
 H_2SO_4 conc. — turquoise blue; on dilution — violet

24340 C.I. Direct Blue 10 (Blue)

o-Dianisidine \rightleftharpoons Chromotropic acid (2 mol.)

Discoverer — H. Kuzel 1890

M.L.B., BP 9258/90, 5904/91; USP 458283; FP 212607; GP 69095 (Fr. 3, 588)

BIOS 1548, 175

FIAT 764 — Dianilblau G

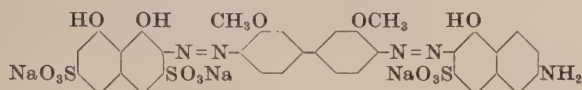
Soluble in water (deep blue)

Moderately soluble in ethanol

H₂SO₄ conc. — greenish blue; on dilution — bright reddish blue

Aqueous solution + HCl conc. — deep blue

+ NaOH conc. — violet black

24345 Direct Dye

o-Dianisidine \rightleftharpoons Chromotropic acid
(*alk.*) J acid

Discoverer — Kalle Co.

Naphthamine Brilliant Blue BWO (K)

For dyes of similar constitution see —

Griesheim-Elektron, USP 860220-1; GP 196924, 200054, (Fr. 9, 377, 378)

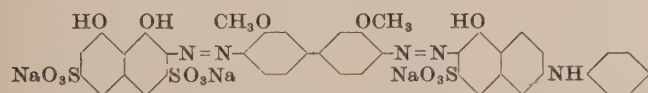
Soluble in water (violet);

Slightly soluble in ethanol

H₂SO₄ conc. — turquoise blue; on dilution — violet

Aqueous solution + HCl conc. — bluish violet;

+ NaOH conc. — dark violet

24350 Direct Dye

o-Dianisidine \rightleftharpoons (1) Chromotropic acid
(2) (*alk.*) *N*-Phenyl J acid

Discoverer — Kalle Co.

Cupramine Brilliant Blue RB (K)

Fastness Properties (C), Acid (organic) 4, Alkali 4, Light 3, Washing 1-2, Water 2

Dischargeability: neutral, good; alkaline, fairly good

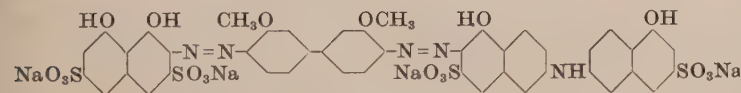
FIAT 764 — Cupraminbrillantblau RB

Soluble in water, moderately soluble in ethanol (violet)

H₂SO₄ conc. — bluish green; on dilution — violet

Aqueous solution + HCl conc. — reddish violet, ppt;

+ NaOH conc. — reddish violet, ppt.

24355 Direct Dye

o-Dianisidine \rightleftharpoons (1) Chromotropic acid
(2) Di-J acid

Discoverers — A. Blank and W. Bergdoldt 1911

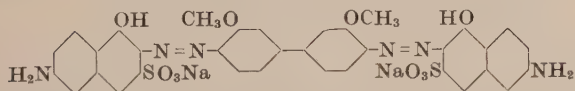
Union Blue 3R (By)

Fastness Properties, on cotton (C): Acid (organic) 4, Alkali 5, Light 3, Washing 1-2, Water 2

Bayer Co., BP 8184/13; USP 1082923, 1087429; FP 456432;

GP ap. F34324 (Fr. 11, 436)

FIAT 764 — Halbwohlblau 3R

24360 C.I. Direct Blue 152 (Dull reddish blue)

o-Dianisidine \rightleftharpoons (*alk.*) J acid (2 mol.)

Discoverer — Bayer Co. 1889

Diazo Fast Black 3B (By)

Fastness Properties (C), developed with 2-naphthol: Light 3, Washing 3. Developed with toluene-2,4-diamine: Light 4, Washing 3

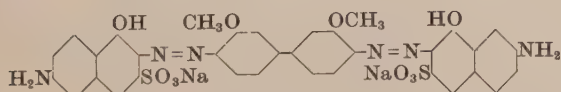
Soluble in water (navy blue)

Slightly soluble in ethanol (pale corinth)

H₂SO₄ conc. — turquoise blue; on dilution — violet

Aqueous solution + HCl conc. — dark blue, ppt;

+ NaOH conc. — corinth, ppt.

24361 Direct Dye

o-Dianisidine \rightleftharpoons (*alk.*) J acid
(*alk.*) Gamma acid

Discoverer — M. Herzberg 1914

Benzoform Blue G Extra (By)

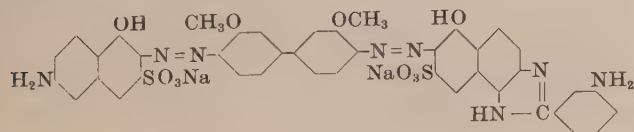
Bayer Co., USP 1160406; GP 295072 (Fr. 13, 526)

Soluble in water (dark navy blue) and ethanol (violet)

H₂SO₄ conc. — bluish green; on dilution — violet

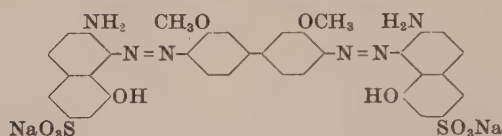
Aqueous solution + HCl conc. — hue practically unchanged, ppt;

+ NaOH conc. — reddish violet, ppt.

24365 Direct Dye

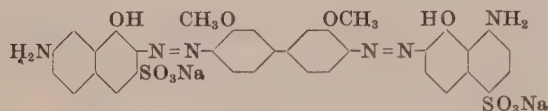
o-Dianisidine \rightleftharpoons (2) (*alk.*) J acid
(1) 2-(*m*-Aminophenyl)-6-hydroxy-1*H*-naphth-[1,2]imidazole-8-sulfonic acid

24370 C.I. Direct Violet 37 (Bluish violet)



o-Dianisidine \rightarrow (acid) Gamma acid (2 mol.)

24375 Direct Dye



o-Dianisidine \rightarrow (1) (alk.) Gamma acid
(2) (alk.) S acid

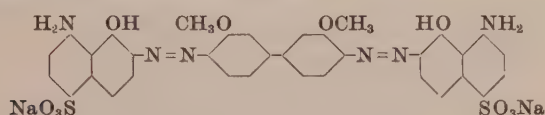
Discoverer — Agfa 1892

Zambesi Black BR (Agfa)

Fastness Properties (C), developed with 2-naphthol:
Acid (organic) 5, Alkali 5, Light 3, Washing 3, Water 3-4
GP 98969 (*Fr.* 5, 562)

Soluble in water (navy blue)
Slightly soluble in ethanol (violet)
H₂SO₄ conc. — turquoise blue; on dilution — violet, ppt.
Aqueous solution + HCl conc. — violet, ppt;
+ NaOH conc. — dullish violet, ppt.

24380 C.I. Direct Blue 4 (Blue)



o-Dianisidine \rightarrow (alk.) S acid (2 mol.)

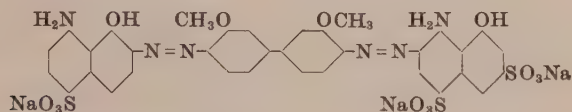
Discoverer — M. Möller 1893

FIAT 764 — Chicagoblau B

JSDC, 9 (1893), 127

Soluble in water (blue)
Insoluble in organic solvents
H₂SO₄ conc. — bluish green; on dilution — reddish blue
HNO₃ conc. — reddish blue solution
Aqueous solution + NaOH 10% — bright blue

24385 Direct Dye



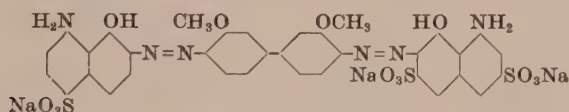
o-Dianisidine \rightarrow (2) (alk.) S acid
(1) (acid) K acid

Discoverer — Bayer Co. 1911

Para Dark Green 3B (By)

Moderately soluble in water (violet black)
Very slightly soluble in ethanol
H₂SO₄ conc. — dull greenish blue; on dilution — pale greyish violet
Aqueous solution + HCl conc. — blackish violet, ppt;
+ NaOH conc. — unchanged

24390 Direct Dye



o-Dianisidine \rightarrow (2) (alk.) S acid
(1) (alk.) H acid

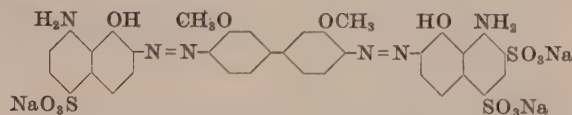
Discoverers — M. Ulrich and J. Bammann 1894

Benzo Cyanine 3B (By)

Cotton dyed "pure blue" rendered faster to light by after-treatment with copper salts
Bayer Co., USP 533508, 578432, 603008; GP ap. F5667

Soluble in water (blue)
H₂SO₄ conc. — greenish blue; on dilution — blue ppt.
Aqueous solution + HCl — soluble blue ppt;
+ NaOH — soluble blue ppt.

24395 Direct Dye



o-Dianisidine \rightarrow (2) (alk.) S acid
(1) (alk.) Chicago acid

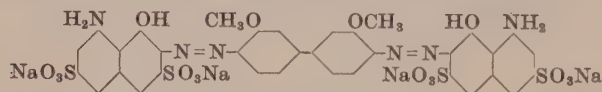
Discoverer — M. Möller 1894

Chicago Blue 4B (A)

Cotton dyed "greenish blue" rendered faster to light by after-treatment with copper salts
FIAT 764 — Brillantbenzoblau 6B
Chem. Ind. 17 (1894), 553
JSDC, 11 (1895), 76

Soluble in water (blue)
H₂SO₄ conc. — green; on dilution — blue
Aqueous solution + HCl — unaltered;
+ NaOH — violet

24400 C.I. Direct Blue 15 (Blue)



o-Dianisidine \rightarrow (alk.) H acid (2 mol.)

Discoverers — J. Bammann, M. Ulrich and M. Hoffmann 1890

Cassella Co., BP 1742/91; USP 464135, 498874, 501500;
FP 201770; GP 74593 (*Fr.* 3, 684)

BIO S 1548, 175

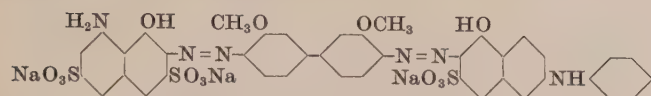
FIAT 764 — Benzoreinblau

Soluble in water (reddish blue)
Insoluble in organic solvents
H₂SO₄ conc. — bluish green; on dilution — reddish blue
HNO₃ conc. — reddish grey solution

Aqueous solution + HCl conc. — reddish blue, ppt;
+ NaOH conc. — violet, ppt.

24401 C.I. Direct Blue 218 (Greenish blue)

Convert C.I. 24400 into the copper complex

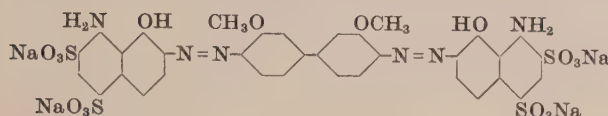
24405 C.I. Direct Blue 23 (Blue)

o-Dianisidine $\begin{matrix} \nearrow (1) \text{ (alk.) H acid} \\ \searrow (2) \text{ (alk.) } N\text{-Phenyl J acid} \end{matrix}$

Discoverer — Kalle Co.

FIAT 764 — Naphthaminblau TBF

Soluble in water (blue) and Cellosolve
Slightly soluble in ethanol (pale reddish violet)
Insoluble in other organic solvents
 H_2SO_4 conc. — greenish blue; on dilution — reddish blue to violet
Aqueous solution + HCl conc. — dark violet, ppt;
+ NaOH conc. — dark violet, ppt.

24410 C.I. Direct Blue 1 (Bright greenish blue)

o-Dianisidine \rightleftharpoons (alk.) Chicago acid (2 mol.)

Aqueous solution + H_2SO_4 10% — no change
+ NaOH conc. — reddish blue

Discoverers — M. Ulrich and J. Bammann 1891

M. Möller 1894

Agfa, BP 5039/93; USP 539699; FP 229339; GP 82966 (Fr. 4, 951)

FIAT 764 — Chicagoblau 6B

JSDC, 11 (1895), 135

Dubsky & Okáč, Rec. Trav. Chim. 46 (1927), 296

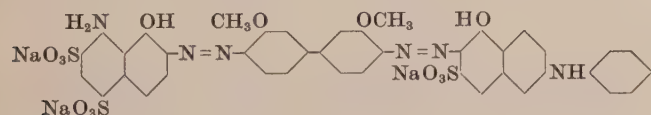
Mills & Robinson, Proc. Roy. Soc. A131 (1931), 576

Neale & Stringfellow, JSDC, 59 (1943), 241

Very soluble in water (bright blue)
Slightly soluble in Cellosolve
Insoluble in other organic solvents
 H_2SO_4 conc. — bluish green; on dilution — blue
 HNO_3 conc. — reddish violet solution

24411 C.I. Direct Blue 76 (Greenish blue)

Convert C.I. 24410 into the copper complex

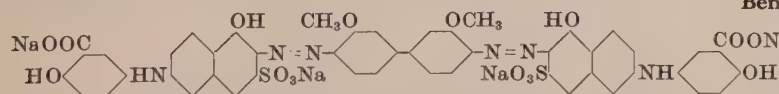
24415 C.I. Direct Blue 215 (Greenish blue)

o-Dianisidine $\begin{matrix} \nearrow (1) \text{ Chicago acid} \\ \searrow (2) \text{ (alk.) } N\text{-Phenyl J acid} \end{matrix}$

Discoverer — Agfa

FIAT 764 — Brillantkupferblau GW

Soluble in water (bluish violet)
Moderately soluble in ethanol
 H_2SO_4 conc. — turquoise blue; on dilution — violet
Aqueous solution + HCl conc. — reddish blue;
+ NaOH conc. — dullish violet, ppt.

24420 Direct Dye

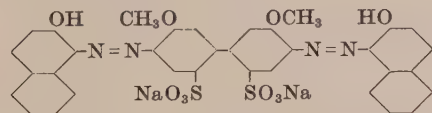
o-Dianisidine \rightleftharpoons *N*-(3-Carboxy-4-hydroxyphenyl) J acid (2 mol.)

Discoverer — I.G.

Benzo Fast Chrome Blue (IG)

A chromable direct dye of a type developed for use on cotton/wool unions in combination with neutral dyeing metallised (chromium) acid dyes

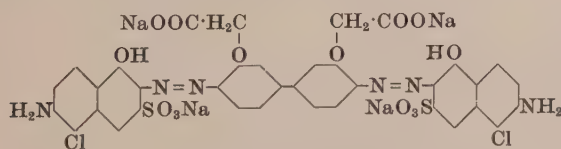
BIOS 961, 91

24500 C.I. Acid Red 86 (Red)

4,4'-Diamino-5,5'-dimethoxy-2,2'-biphenyldisulfonic acid
 \rightleftharpoons 2-Naphthol (2 mol.)

FIAT 764 — Walkrot 6BA

Moderately soluble in water (crimson) and acetone
Slightly soluble in ethanol
 H_2SO_4 conc. — violet; on dilution — bluish violet ppt;
NaOH — dark red solution

24550 C.I. Direct Blue 164 (Reddish navy)*

(4,4'-Diamino-3,3'-biphenylylenedioxy)diacetic acid
 \rightleftharpoons 6-Amino-5-chloro-1-naphthol-3-sulfonic acid (2 mol.)

* Aftertreated with copper sulfate

Discoverers — C. Taube and O. Bayer 1936

I.G., BP 472043; USP 2158843; FP 818154; GP 684524 (Fr.-Bayer, I-1, 1173)

BIOS 1548, 114

FIAT 764 — Benzoechtakupfermarineblau 3RL

Soluble in water (dark violet)
Slightly soluble in ethanol
 H_2SO_4 conc. — turquoise blue; on dilution — blue
Aqueous solution + HCl conc. — blue, ppt;
+ NaOH conc. — reddish violet

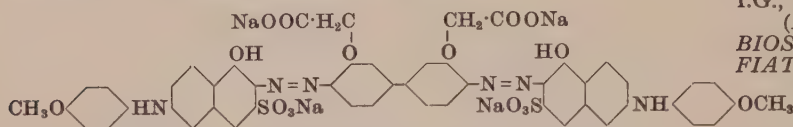
24555 C.I. Direct Blue 158 (Dull blue)*

Discoverers — C. Taube and O. Bayer 1936

I.G., BP 472043; USP 2158843; FP 818154; GP 684524
(Fr.-Bayer, I-1, 1173)

BIOS 1548, 111

FIAT 764 — Benzoechtkupferblau FBL

(4,4'-Diamino-3,3'-biphenylenedioxy)diacetic acid
 \Rightarrow *N*-*p*-Methoxyphenyl J acid (2 mol.)

* Aftertreated with copper sulfate

Soluble in water (bright blue)

Slightly soluble in ethanol

 H_2SO_4 conc. — blue; on dilution — violet, ppt.

Aqueous solution + HCl conc. — bright blue, ppt;

+ NaOH conc. — dark violet, ppt.

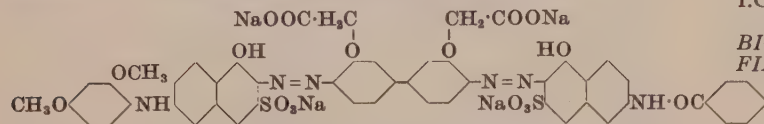
24560 C.I. Direct Blue 167 (Navy)*

Discoverers — C. Taube, S. Petersen and E. Stein 1939

I.G., USP 2158843, 2277262; FP 875169; GP 741968 (Fr.-Bayer, I-1, 1255)

BIOS 1548, 116

FIAT 764 — Benzoechtkupfermarineblau 3BL (error for BL)

(4,4'-Diamino-3,3'-biphenylenedioxy)diacetic acid
 $\xrightarrow{(2)}$ *N*-(2,4-Dimethoxyphenyl) J acid
 $\xrightarrow{(1)}$ *N*-Benzoyl J acid

* Aftertreated with copper sulfate

Soluble in water (deep blue)

Slightly soluble in ethanol

 H_2SO_4 conc. — deep blue; on dilution — violet

Aqueous solution + HCl conc. — dark blue, ppt;

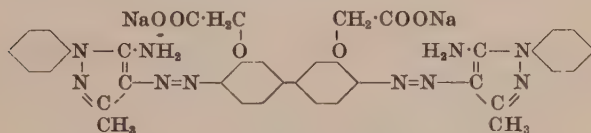
+ NaOH conc. — dark blue, ppt.

24565 C.I. Direct Red 180 (Yellowish red)*

Discoverers — C. Taube, H. Rinke and E. Fischer 1938

I.G., USP 2241796; FP 855406; GP 711384 (Fr.-Bayer, I-1, 1233)

FIAT 764 — Benzoechtkupferrot GGL

(4,4'-Diamino-3,3'-biphenylenedioxy)diacetic acid
 \Rightarrow 5-Imino-3-methyl-1-phenyl-2-pyrazoline (2 mol.)

* Aftertreated with copper sulfate

Soluble in water (yellowish orange) and ethanol

 H_2SO_4 conc. — reddish violet; on dilution — pale yellowish brown

Aqueous solution + HCl conc. — orange brown, ppt;

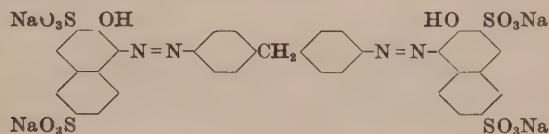
+ NaOH conc. — unchanged

24750 Acid Dye (Yellowish red)**Milling Red R (WDC)**

Dyes wool from an acid bath in a bright red shade of good fastness to light and milling

For similar dyes see —

Beyer and Kegel, GP 43644 (Fr. 1, 528)

4,4'-Methylenedianiline \Rightarrow R acid (2 mol.)

Soluble in water (bright red); insoluble in ethanol

 H_2SO_4 conc. — bordeaux; on dilution — bluish red

Aqueous solution + HCl conc. — unaltered;

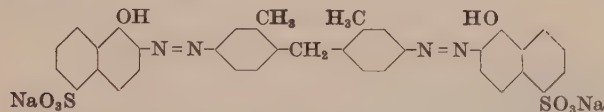
+ NaOH — duller

24760 Acid Dye**Milling Scarlet B (MLB)**

Applied from a weak acid dye bath

M.L.B., GP 252916 (Fr. 11, 384)

FIAT 764 — Walkscharlach B

4,4'-Methylenedi-*m*-toluidine \Rightarrow 1-Naphthol-5-sulfonic acid (2 mol.)

Soluble in water (red)

Slightly soluble in ethanol (orange red)

 H_2SO_4 conc. — reddish violet and blue; on dilution — red

Aqueous solution + HCl conc. — red;

+ NaOH conc. — brownish orange

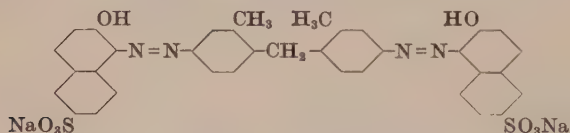
24765 C.I. Acid Orange 55 (Reddish orange)

Discoverer — Cassella Co.

Brilliant Milling Orange GR (C)

Dahl Co., GP 4776 (Fr. 4, 713)

FIAT 764 — Brillantwalkorange GR

4,4'-Methylenedi-*m*-toluidine \Rightarrow Schaeffer's acid (2 mol.)

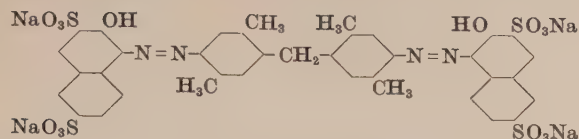
Soluble in water (orange red)

Insoluble in ethanol

 H_2SO_4 conc. — red; on dilution — orange red

Aqueous solution + HCl conc. — orange red ppt;

+ NaOH conc. — brownish orange

24770 Acid Dye

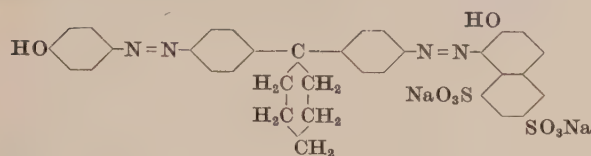
4,4'-Methylenedi-2,5-xylylidine \Rightarrow R acid (2 mol.)

Cinnabar Scarlet BF (BK)

A direct dye formerly used for the preparation of heavy metal salts

M.L.B., GP 270663 (*Fr.* 11, 155)

Soluble in water (bluish red); insoluble in ethanol
H₂SO₄ conc. — bluish red; on dilution — unaltered
Aqueous solution + HCl — unaltered;
+ NaOH — yellower

24780 C.I. Acid Orange 33 (Reddish orange)

4,4'-Cyclohexylidenedianiline $\begin{cases} (2) \text{ Phenol} \\ (1) \text{ G acid} \end{cases}$

Discoverers — R. Schüle and E. Korten 1928

I.G., BP 335893, 337860; USP 1838235; FP 670617; GP 556480 (*Fr.* 19, 1750)

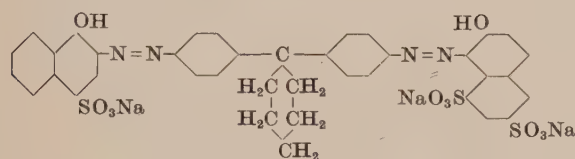
BIOS 1548, 45

FIAT 764 — Supranolorange GS

Soluble in water (golden orange); moderately soluble in ethanol (golden orange)

H₂SO₄ conc. — orange; on dilution — orange

Aqueous solution + HCl conc. — orange;
+ NaOH conc. — brownish yellow

24785 Acid Dye

4,4'-Cyclohexylidenedianiline $\begin{cases} (2) \text{ Neville and Winther's acid} \\ (1) \text{ G acid} \end{cases}$

Aqueous solution + HCl conc. — orange red;
+ NaOH conc. — orange brown

Discoverers — R. Schüle and E. Korten 1928

Supranol Scarlet FG (By)

Applied from a weak acid dyebath. Levelling moderate.
Fastness Properties (C): Light 5, Washing 3-4,
Perspiration 4, Milling 4. Dischargeability, good

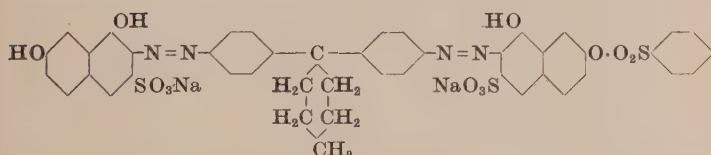
I.G., BP 335893; USP 1838235; FP 670617; GP 556480 (*Fr.* 19, 1750)

FIAT 764 — Supranolscharlach FG

Soluble in water (orange red)

Slightly soluble in ethanol (golden yellow)

H₂SO₄ conc. — reddish violet; on dilution — orange

24790 C.I. Acid Red 163 (Red)

4,4'-Cyclohexylidenedianiline \Rightarrow 4,6-Dihydroxy-2-naphthalenesulfonic acid (2 mol.);
then esterify with benzenesulfonyl chloride (1 mol.)

Discoverers — R. Schüle and E. Korten 1928

I.G., BP 335893; USP 1838235; FP 670617; GP 556480 (*Fr.* 19, 1750)

BIOS 1548, 55

FIAT 764 — Supranolrot BR

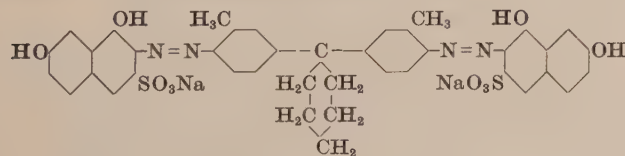
Soluble in water (red)

Slightly soluble in ethanol (red)

H₂SO₄ conc. — deep violet; on dilution — pink

Aqueous solution + HCl conc. — red;

+ NaOH conc. — reddish orange brown

24800 C.I. Acid Red 154 (Bluish red)

4,4'-Cyclohexylidenedi-o-toluidine \Rightarrow 4,6-Dihydroxy-2-naphthalenesulfonic acid (2 mol.)

Discoverers — R. Schüle and E. Korten 1928

I.G., BP 335893; USP 1838235; FP 670617; GP 556480 (*Fr.* 19, 1750)

FIAT 764 — Supranolrot BB

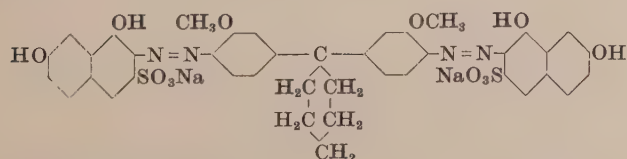
Soluble in water (magenta red)

Slightly soluble in ethanol (magenta red)

H₂SO₄ conc. — blue; on dilution — magenta red

Aqueous solution + HCl conc. — wine red;

+ NaOH conc. — bordeaux

24810 C.I. Acid Red 134 (Bordeaux)

4,4'-Cyclohexylidenedi-o-anisidine \Rightarrow 4,6-Dihydroxy-2-naphthalenesulfonic acid (2 mol.)

Discoverers — R. Schüle and E. Korten

I.G., BP 335893; USP 1838235; FP 670617; GP 556480 (*Fr.* 19, 1750)

BIOS 1548, 61

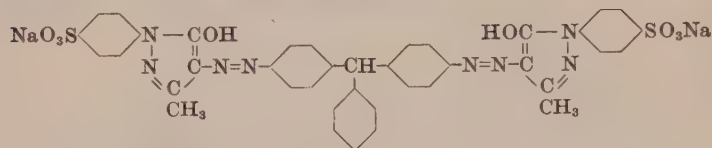
FIAT 764 — Supranolbordo B

Soluble in water (bordeaux) and ethanol (magenta red)

H₂SO₄ conc. — deep blue; on dilution — ruby

Aqueous solution + HCl conc. — bordeaux;

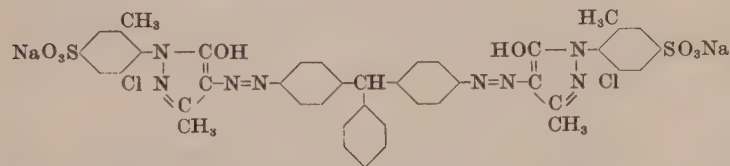
+ NaOH conc. — wine red

24820 C.I. Acid Yellow 117 (Yellow)

4,4'-Benzylidenedianiline
 \rightleftharpoons 3-Methyl-1-(*p*-sulfophenyl)-5-pyrazolone (2 mol.)

Discoverers — H. Wagner and J. Erber 1913

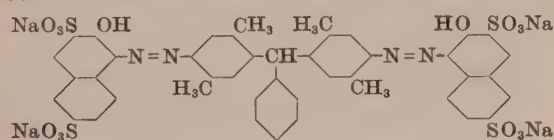
M.L.B., BP 15163/13; USP 1160471; GP 290102 (*Fr.* 12, 314)
 BIOS 961, 67. BIOS 1548, 40
 FIAT 764 — Walkgelb HG

24825 C.I. Acid Yellow 56 (Yellow)

4,4'-Benzylidenedianiline
 \rightleftharpoons 1-(6-Chloro-4-sulfo-*o*-tolyl)-3-methyl-5-pyrazolone (2 mol.)

Discoverers — H. Wagner and J. Erber 1913

M.L.B., BP 15163/13; USP 1160471; GP 290102 (*Fr.* 12, 314)
 BIOS 1548, 41
 FIAT 764 — Walkgelb H3G

24830 C.I. Acid Red 65 (Yellowish red)**24830:1 C.I. Pigment Red 61 (Bright bluish red)**

4,4'-Benzylidenedi-2,5-xylidine \rightleftharpoons R acid (2 mol.)

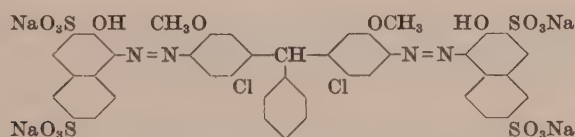
C.I. 24830:1 is the barium salt

Discoverer — O. Hoffmann 1887

Brilliant Carmine L (IG)

Beyer and Kegel, GP 43644 (*Fr.* 1, 528)
 BIOS 1548, 208
 FIAT 764 — Brillantcarmin L
 King, JCS (1932), 1267

Soluble in water (dark red); insoluble in ethanol
 H₂SO₄ conc. — bluish red; on dilution — red
 Aqueous solution + HCl — unaltered
 + NaOH — deeper red

24840 Dye for Lakes

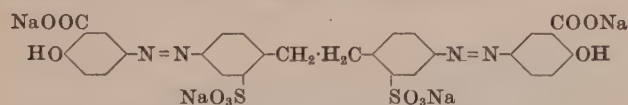
4,4'-Benzylidenebis(5-chloro-*o*-anisidine) \rightleftharpoons R acid (2 mol.)

Lake Purple 3B (B)

The heavy metal lakes used as pigments for paper colouring and surfacing

FIAT 764 — Lackpurpur 3B

Soluble in water (bordeaux red)
 Very slightly soluble in ethanol (bluish red)
 H₂SO₄ conc. — dark reddish violet; on dilution — bluish red
 Aqueous solution + HCl — little change;
 + NaOH conc. — reddish brown

24850 C.I. Direct Yellow 73 (Greenish yellow)*

4,4'-Diaminobenzyl-2,2'-disulfonic acid \rightleftharpoons Salicylic acid (2 mol.)

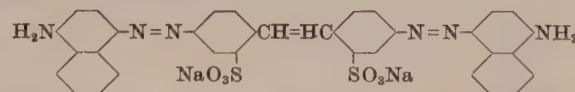
* With chromium salts

Discoverers — K. Heusner, A. Modersohn and F. Suckfüll 1939

I.G., GP 709722

FIAT 764 — Ergansoga Koenig GG

Very soluble in water (greenish yellow)
 Slightly soluble in ethanol
 H₂SO₄ conc. — golden orange; on dilution — hue unchanged
 Aqueous solution + HCl conc. — orange, ppt;
 + NaOH conc. — golden orange

24860 Direct Dye

4,4'-Diamino-2,2'-stilbenedisulfonic acid \rightleftharpoons 1-Naphthylamine (2 mol.)

Discoverers — F. Bender and G. Schultz 1886

Hessian Bordeaux (L)

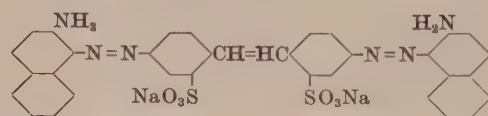
May be diazotised and developed on the fibre

Leonhardt Co., BP 4387/86; USP 350230, 360553; FP 175630;
 GP 38735 (*Fr.* 1, 510)

Bender and Schultz, *Ber.* 19, 3237

Aqueous solution + HCl — blue ppt;
 + NaOH conc. — red ppt.

Soluble in water (deep red) and ethanol (red)
 H₂SO₄ conc. — bluish violet; on dilution — bluish violet ppt.

24865 Direct Dye

4,4'-Diamino-2,2'-stilbenedisulfonic acid \rightleftharpoons 2-Naphthylamine (2 mol.)

Discoverers — F. Bender and G. Schultz 1886

Hessian Purple N (L)

Fastness Properties (C): Acid (organic) 1, Alkali 5,
 Light 1, 1, 1, Washing 1-2, Water 1-2

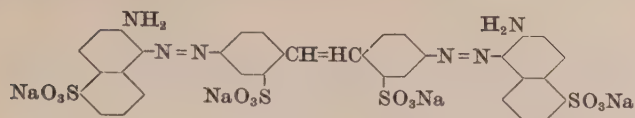
Dischargeability: neutral and alkaline, fair — fairly good

Leonhardt Co., BP 4387/86; USP 350230, 360553; FP 175630;
 GP 38735, 40575, (*Fr.* 1, 510, 512)

Bender & Schultz, *Ber.* 19 (1886), 3237

Aqueous solution + HCl conc. — greyish blue, ppt;
 + NaOH conc. — scarlet, ppt.

Soluble in water (scarlet)
 Moderately soluble in ethanol (orange red to scarlet)
 H₂SO₄ conc. — blue; on dilution — greyish blue, ppt.

24870 Direct Dye

4,4'-Diamino-2,2'-stilbenedisulfonic acid
 \Rightarrow 6-Amino-1-naphthalenesulfonic acid (2 mol.)

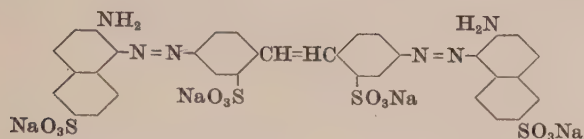
Discoverers — F. Bender and G. Schultz 1886

Hessian Purple D (L)

Dischargeability, poor

Patents as for C.I.24865

Soluble in water (orange red)
 H_2SO_4 conc. — violet; on dilution — brown solution and ppt.
 Aqueous solution + HCl — brown ppt;
 + NaOH — bluer

24875 Direct Dye

4,4'-Diamino-2,2'-stilbenedisulfonic acid \Rightarrow Broenner's acid (2 mol.)

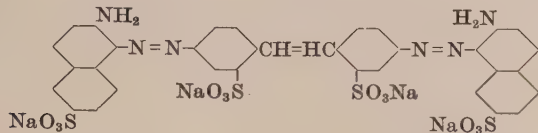
Discoverers — F. Bender and G. Schultz 1886

Brilliant Hessian Purple (L)

Dischargeability, poor

Patents as for C.I.24865

Soluble in water (orange red); very slightly soluble in ethanol
 H_2SO_4 conc. — blue; on dilution — bluish black ppt.
 Aqueous solution + HCl conc. — bluish black ppt;
 + NaOH conc. — soluble carmine red ppt.

24880 Direct Dye

4,4'-Diamino-2,2'-stilbenedisulfonic acid
 \Rightarrow Broenner's acid
 \Rightarrow 7-Amino-2-naphthalenesulfonic acid

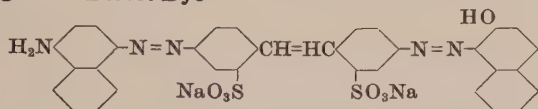
Discoverers — F. Bender and G. Schultz 1886

Hessian Purple B (L)

Dischargeability, poor

Patents as for C.I.24865

Soluble in water (cherry red)
 H_2SO_4 conc. — violet; on dilution — brown ppt.
 Aqueous solution + HCl — brownish black ppt;
 + NaOH — soluble reddish violet ppt.

24885 Direct Dye

4,4'-Diamino-2,2'-stilbenedisulfonic acid
 \Rightarrow 1-Naphthylamine
 \Rightarrow 2-Naphthol

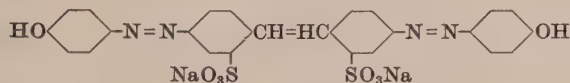
Discoverers — F. Bender and G. Schultz 1886

Hessian Violet (L)

Dischargeability, poor

Patents as for C.I.24865

Soluble in water (reddish violet)
 H_2SO_4 conc. — blue; on dilution — violet ppt.
 Aqueous solution + HCl — blue, ppt;
 + NaOH — bluish violet

24890 C.I. Direct Yellow 4 (Bright yellow)

4,4'-Diamino-2,2'-stilbenedisulfonic acid \Rightarrow Phenol (2 mol.)

Aqueous solution + HCl conc. — dullish violet, ppt;
 + NaOH conc. — brownish orange; + NaOH 10% — scarlet

Discoverers — F. Bender and G. Schultz 1886

Patents as for C.I.24865

BIOS 1548, 147

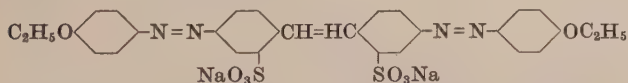
FIAT 764 — Brillantgelb

Seyewetz & Chaix, *Bull. Soc. chim.* **41** (1927), 332

Soluble in water (golden yellow)
 Moderately soluble in ethanol (golden yellow)
 Slightly soluble in acetone and Cellosolve
 H_2SO_4 conc. — reddish violet; on dilution — violet (blackish violet ppt.)
 HNO_3 conc. — dark brown solution (incomplete)

24895 C.I. Direct Yellow 12 (Reddish yellow)

Classical name **Chrysophenine**



Ethylate the hydroxy groups in C.I.24890

Eukanolbrillantgelb O (IG) was the ammonium salt

Aqueous solution + HCl conc. — dark corinth, ppt;
 + NaOH conc. — golden orange, ppt; + NaOH 10% — little change

Discoverer — F. Bender 1886

Leonhardt Co., BP 3994/87; FP 182063; GP 42466 (*Fr.* **2**, 354)

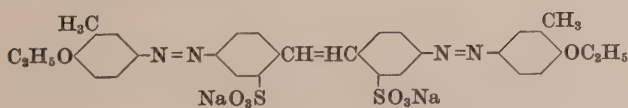
BIOS 1548, 148

FIAT 764 — Chrysophenin, Eukanolbrillantgelb O

Meyer and Schäffer, *Ber.* **27** (1894), 3357

Meyer and Maier, *Ber.* **36** (1903), 2975

Soluble in water (yellow to golden yellow)
 Moderately soluble in ethanol (lemon yellow) and Cellosolve
 Slightly soluble in acetone (greenish yellow)
 H_2SO_4 conc. — reddish violet; on dilution — violet to reddish blue, ppt.

24900 Direct Dye

4,4'-Diamino-2,2'-stilbenedisulfonic acid \Rightarrow *o*-Cresol (2 mol.);
 and ethylate the hydroxy groups

Discoverer — Badische Co.

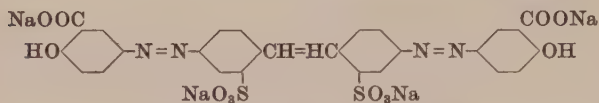
Pyramine Yellow GRX (B)

Dischargeability: neutral, very good; alkaline, poor

FIAT 764 — Pyramingelb GRX

Soluble in water (greenish to golden yellow) and in ethanol (golden yellow)
 H_2SO_4 conc. — reddish violet; on dilution — dullish violet
 Aqueous solution + HCl conc. — corinth, ppt;
 + NaOH conc. — golden orange, ppt.

24910 C.I. Direct Yellow 72 (*Dull reddish yellow* → *Reddish orange*)*



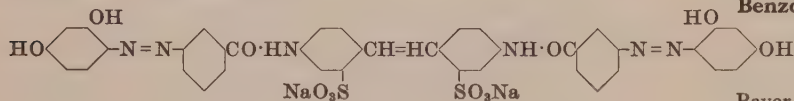
4,4'-Diamino-2,2'-stilbenedisulfonic acid \rightleftharpoons Salicylic acid (2 mol.)

* With chromium salts

Discoverers — F. Bender and G. Schultz 1886
Leonhardt Co., BP 4387/86; USP 350229; GP 38735 (*Fr.* 1, 510)
BIOS 1548, 100
FIAT 764 — Chromsogageib 29424

Soluble in water (yellowish orange)
Slightly soluble in ethanol
H₂SO₄ conc. — reddish violet; on dilution — dark brown to black
HNO₃ conc. — pale yellow solution, grey ppt.
Aqueous solution + HCl conc. — dark brown, ppt;
+ NaOH conc. — red

24920 Direct Dye



4,4'-Bis(*m*-aminobenzamido)-2,2'-stilbenedisulfonic acid
 \rightleftharpoons Resorcinol (2 mol.)

Aqueous solution + HCl conc. — yellowish orange brown, ppt;
+ NaOH conc. — orange brown

Discoverers — A. Blank, C. Heidenreich and J. Jansen 1912

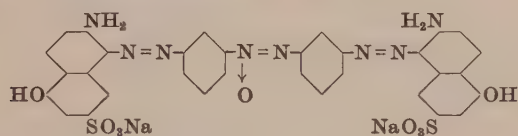
Benzoform Yellow R (By)

Fastness Properties (C), aftertreated with formaldehyde: Acid (organic) 3, Alkali 3, Light 1, Washing 3, Water 3

Bayer Co., BP 19989/12; USP 1082924; FP 456674; GP 269849 (*Fr.* 11, 426)

Soluble in water (reddish yellow)
Very slightly soluble in ethanol
H₂SO₄ conc. — reddish yellow; on dilution — pale yellow

25000 C.I. Direct Red 169 (*Dull red*)*



(a) *m*-Nitroaniline → (*acid*) J acid;
then reduce the nitro group with an aqueous solution of glucose and caustic soda

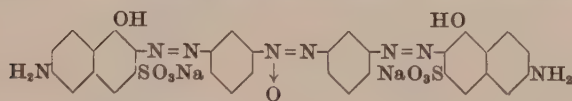
(b) *m,m'*-Azoxydianiline \rightleftharpoons (*acid*) J acid (2 mol.)

* Coupled with diazotised *p*-nitroaniline

Cassella Co., GP 211029, 213278, (*Fr.* 9, 378, 380)
FIAT 764 — Diaminnitrazolbordo GB

Soluble in water (orange brown)
Slightly soluble in ethanol
H₂SO₄ conc. — dark olive brown; on dilution — yellowish brown
Aqueous solution + HCl conc. — dark brown, ppt;
+ NaOH conc. — reddish orange to brown

25005 C.I. Direct Red 148 (*Bordeaux* → *Dull reddish violet*)*



(a) *m*-Nitroaniline → (*alk.*) J acid;
then reduce the nitro group with an aqueous solution of glucose and caustic soda

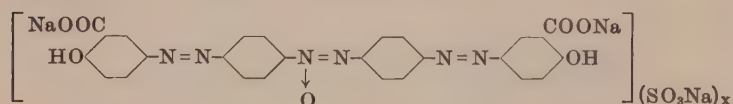
(b) *m,m'*-Azoxydianiline \rightleftharpoons (*alk.*) J acid (2 mol.)

* Developed with 2-naphthol

Discoverers — K. Jedlicka and A. Schedler 1903
Geigy Co., BP 27630/03; USP 763761; FP 337449; GP 169732 (*Fr.* 8, 688)
FIAT 764 — Diazobordo 7BD

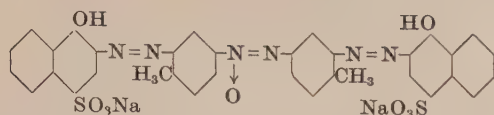
Soluble in water (brownish orange)
Slightly soluble in ethanol
H₂SO₄ conc. — bluish red; on dilution — pale brownish orange
Aqueous solution + HCl conc. — reddish orange
+ NaOH conc. — brownish orange

25010 C.I. Direct Brown 206 (*Dull reddish brown*)



p-Nitroaniline → Salicylic acid;
then reduce the nitro group with an aqueous solution of glucose and caustic soda; finally sulfonate

Ergansoga Brown 3R (IG)
BIOS 961, 27

25015 Direct Red

(1) 5-Nitro-*o*-toluidine → Nevile and Winther's acid;
then reduce the nitro group with an aqueous solution of glucose and caustic soda

(2) 5,5'-Azoxydi-*o*-toluidine ⇌ Nevile and Winther's acid (2 mol.)

Discoverers — D. A. Rosenstiehl and E. Nölting 1887

St. Denis Co., *BP* 9315/87, 11976/87, 5736/90; *FP* 184549; *GP* 44045, 44554, (*Fr.* 2, 436, 437)

Green & Lawson, *BP* 14304/89

Friswell, *BP* 39/90

Friswell & Green, *BP* 134/90

Brooke, Simpson & Spiller & Green, *BP* 6376/91

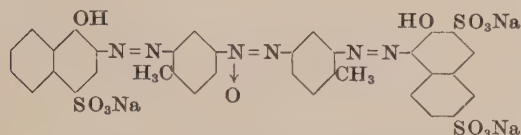
Nölting, *Färberztg.* 1 (1890), 106

Rosenstiehl, *Compt. rend.* 132 (1901), 985

Jansen, *Z. Färb. Ind.* 12 (1913), 181

Fierz-David, 199

Slightly soluble in water (red) and ethanol
H₂SO₄ conc. — red; on dilution — red ppt.
Aqueous solution + HCl — red ppt;
+ NaOH — soluble brick red ppt.

25020 Acid Dye

5,5'-Azoxydi-*o*-toluidine $\xrightarrow{(1)}$ Nevile and Winther's acid
 $\xrightarrow{(2)}$ R acid

Discoverers — A. F. Poirier and D. A. Rosenstiehl 1889

Acid Milling Scarlet (BSS)

Applied from an acid dye bath, fast to milling

Brooke, Simpson & Spiller, *BP* 10915/92

St. Denis Co., *FP* 184549; *GP* 51363 (*Fr.* 2, 439)

Fierz-David, 199

Soluble in water (scarlet); insoluble in ethanol
H₂SO₄ conc. — bluish red; on dilution — scarlet
Aqueous solution + HCl — unaltered;
+ NaOH — orange red

25030 C.I. Direct Orange 63 (Bright orange)

Disazoazoxy or Trisazo dye

4-Amino-4'-nitro-2,2'-stilbenedisulfonic acid → Phenol;

methylate the hydroxy group and finally reduce with glucose

It is probable that two molecules are linked by formation of an azo or azoxy group from two nitro groups

Discoverers — H. Schindhelm and R. Gast 1932

I.G., *BP* 403105; *USP* 2004250; *FP* 751183; *GP* 591495 (*Fr.* 20, 1203)

BIOS 1548, 120, 121

FIAT 764 — Siriuslichtorange F3G, Sirius Orange I

Soluble in water (golden orange)
Slightly soluble in ethanol
H₂SO₄ conc. — navy blue; on dilution — corinth
Aqueous solution + HCl conc. — dark navy blue, ppt;
+ NaOH conc. — reddish orange, ppt.

25040 C.I. Direct Black 71 (Bluish grey)

Copper complex of a Disazoazoxy or Trisazo dye

4-Nitro-*o*-anisidine → *N-p*-Carboxyphenyl Gamma acid;

reduce with glucose and caustic soda and then treat with ammoniacal copper sulfate solution

It is probable that two molecules of the monoazo dye are linked by formation of an azo or azoxy group from two nitro groups and that during the copper complex formation the two methoxyl groups in the disazoazoxy or trisazo dye are replaced by hydroxyl groups

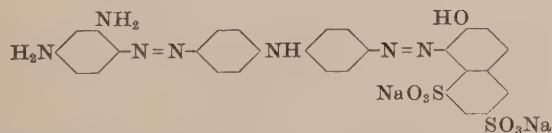
Discoverers — D. Delfs and R. Knoche 1934

I.G., *BP* 443242; *USP* 2051133; *FP* 761959; *GP* 636358 (*Fr.* 23, 869)

BIOS 1548, 144. *FIAT* 764 — Siriuslichtgrau VGL

Standard Russia GOST 9528-60 (Fast Light Grey C)

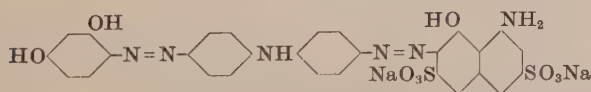
Soluble in water (dark blue to grey); insoluble in ethanol
H₂SO₄ conc. — dark blue; on dilution — greyish violet, ppt.
Aqueous solution + HCl conc. — violet black, ppt;
+ NaOH conc. — deep blue, ppt.

25050 Direct Dye

4,4'-Diaminodiphenylamine $\xrightarrow{(1)}$ *m*-Phenylenediamine
 $\xrightarrow{(2)}$ G acid

Diamine Deep Black 0000 (C)

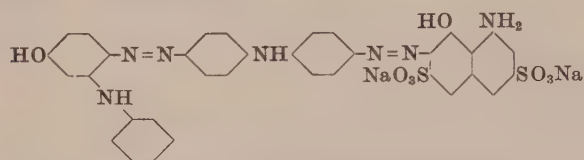
FIAT 764 — Diamintiefschwarz 0000

25055 Leather Dye

4,4'-Diaminodiphenylamine $\xrightarrow{(2)}$ Resorcinol
 $\xrightarrow{(1)}$ (alk.) H acid

Igenal Dark Blue CG (IG)

FIAT 764 — Igenaldunkelblau CG

25060 Leather Dye

4,4'-Diaminodiphenylamine $\xrightarrow{(2) \text{ (alk.) } m\text{-Anilinophenol}}$
 $\xrightarrow{(1) \text{ (alk.) H acid}}$

Igeal Blue Black CB (IG)

FIAT 764 — Igelanblauschwarz CB

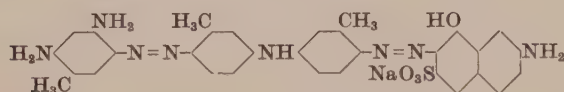
Discoverer — C. Ris 1896

Diphenyl Fast Black (Gy)

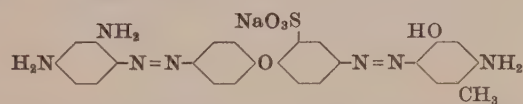
Fastness Properties (C): Acid and alkali, good; Light and Washing, moderate

Geigy Co., BP 16582/96; USP 575904; FP 258521

Soluble in water (violet black) and ethanol (dark violet)
 H₂SO₄ conc. — dark blue; on dilution — bluish black
 Aqueous solution + HCl — bluish black ppt;
 + NaOH — black ppt.

25070 Direct Dye

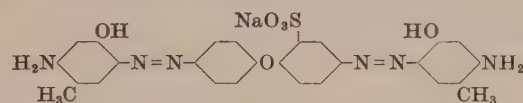
4,4'-Diaminodi-*m*-tolylamine $\xrightarrow{\text{Toluene-2,4-diamine}}$
 $\xrightarrow{\text{(alk.) Gamma acid}}$

25080 Direct Dye

6-(*p*-Aminophenoxy)metanilic acid $\xrightarrow{(2) \text{ } m\text{-Phenylenediamine}}$
 $\xrightarrow{(1) \text{ 3-Amino-}p\text{-cresol}}$

Diamine Nitrazol Brown GF (C)

May be coupled with diazotised *p*-nitroaniline
 Cassella Co., FP 422709; GP 231165 (Fr. 10, 872)

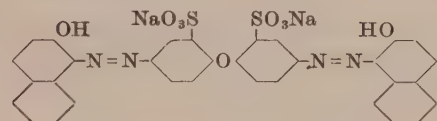
25085 C.I. Direct Orange 92 (Dull reddish orange)*

6-(*p*-Aminophenoxy)metanilic acid \rightleftharpoons 3-Amino-*p*-cresol (2 mol.)

* Coupled with diazotised *p*-nitroaniline

Cassella Co., FP 422709; GP 231165 (Fr. 10, 872)
 FIAT 764 — Diaminnitrazolorange R

Moderately soluble in water (orange brown)
 Slightly soluble in ethanol (yellowish orange)
 H₂SO₄ conc. — dull orange brown; on dilution — orange brown
 Aqueous solution + HCl conc. — reddish brown ppt;
 + NaOH conc. — reddish brown

25090 Acid Dye

6,6'-Oxydimetanilic acid \rightleftharpoons 2-Naphthol (2 mol.)

Milling Red GA (IG)

FIAT 764 — Walkrot GA

25100 C.I. Mordant Yellow 16 (Dull reddish yellow)

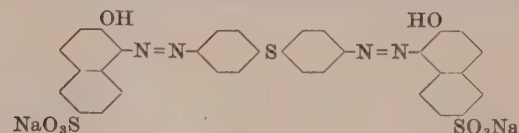
4,4' (and 2,4')-Thiodianiline \rightleftharpoons Salicylic acid (2 mol.)

(Some brands may be made from the *p,p'*-thiodianiline alone)

Discoverer — Cassella Co. 1891

BIO 1548, 81. FIAT 764 — Anthracengelb C
 Sircar & Watson, JSCI, 31 (1912), 968

Soluble in water (greenish yellow); slightly soluble in Celiosolve;
 almost insoluble in ethanol
 H₂SO₄ conc. — dark corinth; on dilution — pale yellow
 HNO₃ conc. — olive green
 Aqueous solution + HCl conc. — pale yellow;
 + NaOH conc. — golden orange

25110 Acid Dye (Yellowish red)

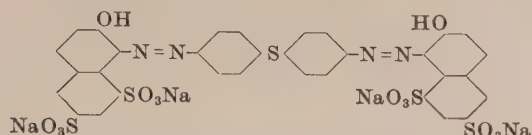
4,4'-Thiodianiline \rightleftharpoons Schaeffer's acid (2 mol.)

Discoverer — Cassella Co. 1893

Milling Red G (C)

FIAT 764 — Walkrot G

Soluble in water (reddish orange to brown)
 Slightly soluble in ethanol (orange)
 H₂SO₄ conc. — bordeaux; on dilution — orange
 Aqueous solution + HCl conc. — orange brown;
 + NaOH conc. — orange brown

25115 Acid Dye

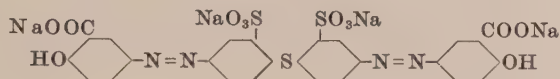
4,4'-Thiodianiline \Rightarrow G acid (2 mol.)

Discoverer — Cassella Co. 1893

Milling Red FR (C)

Applied from a weak acid dye bath

Soluble in water (red)
Slightly soluble in ethanol (orange red)
 H_2SO_4 conc. — dark blue; on dilution — red
Aqueous solution + HCl conc. — red;
+ NaOH conc. — orange brown

25130 C.I. Direct Yellow 74 (Reddish yellow)*

6,6'-Thiodimetanilic acid \Rightarrow Salicylic acid (2 mol.)

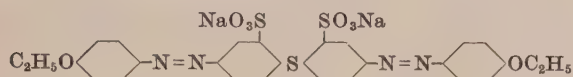
* With chromium salts

Discoverers — K. Heusner, F. Suckfüll and A. Modersohn 1939

I.G., GP 709722

FIAT 764 — Ergansoga Koenig MAS

Soluble in water (reddish yellow to orange)
Very slightly soluble in ethanol
 H_2SO_4 conc. — red; on dilution — greenish yellow
Aqueous solution + HCl conc. — olive brown, ppt;
+ NaOH conc. — orange brown

25135 C.I. Acid Yellow 38 (Yellow)

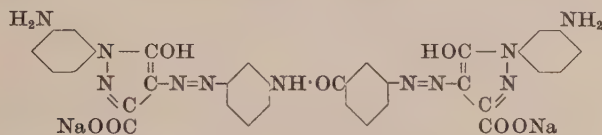
6,6'-Thiodimetanilic acid \Rightarrow Phenol (2 mol.);
and ethylate the hydroxy groups with ethyl chloride under pressure

Discoverer — H. Geldermann 1906

Agfa, BP 7146/07; USP 880293; FP 386316; GP 192890 (Fr. 9, 310)

FIAT 764 — Walkgelb O

Very soluble in water and ethanol (greenish yellow)
Slightly soluble in acetone
 H_2SO_4 conc. — cherry red; on dilution — greenish yellow
Aqueous solution + HCl conc. — olive to yellow brown, ppt;
+ NaOH conc. — greenish yellow, ppt.

25200 C.I. Direct Orange 73 (Bright reddish orange)*

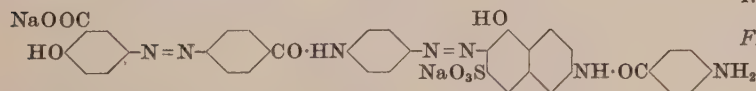
3,3'-Diaminobenzanilide
 \Rightarrow 3-Carboxy-1-(*m*-nitrophenyl)-5-pyrazolone (2 mol.);
and reduce the nitro groups

* Developed with 2-naphthol

Geigy Co., GP 239088 (Fr. 10, 878)

FIAT 764 — Diazobrillantorange R4G

Soluble in water (golden yellow)
Slightly soluble in Cellosolve
Very slightly soluble in ethanol
Insoluble in other organic solvents
 H_2SO_4 conc. — greenish yellow; on dilution — golden yellow
Aqueous solution + HCl conc. — golden yellow, ppt;
+ NaOH conc. — greenish yellow

25210 C.I. Direct Red 155 (Red)*

4,4'-Diaminobenzanilide $\begin{cases} \xrightarrow{(1)} \text{Salicylic acid} \\ \xrightarrow{(2)} \text{N-p-Aminobenzoyl J acid} \end{cases}$

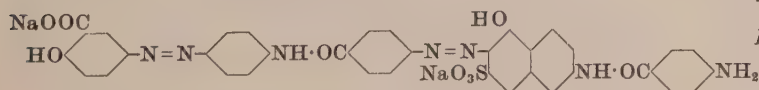
* Developed with 2-naphthol

Discoverer — H. Roos 1934

I.G., BP 442672; USP 2061104, 2172691; FP 791365; GP 663551 (Fr. 25, 639)

FIAT 764 — Diazobrillantscharlach 5BLN ex.

Soluble in water (scarlet to red) and ethanol (reddish orange)
 H_2SO_4 conc. — magenta red; on dilution — pink (dullish red ppt)
Aqueous solution + HCl conc. — bluish red to bordeaux, ppt;
+ NaOH conc. — orange brown, ppt.

25215 C.I. Direct Red 156 (Bright yellowish red)

p-Nitroaniline $\begin{cases} \xrightarrow{(1)} \text{Salicylic acid} \\ \xrightarrow{(2)} \text{reduce the nitro group, treat with p-nitrobenzoyl chloride, reduce the nitro group} \rightarrow (3) \text{N-p-Amino-benzoyl J acid} \end{cases}$

* Developed with 2-naphthol

Discoverer — H. Roos 1934

I.G., BP 451100; USP 2172691; FP 791599; GP 652871 (Fr. 24, 748)

FIAT 764 — Diazobrillantscharlach 3G

Very soluble in water (brownish reddish orange)
Soluble in ethanol
 H_2SO_4 conc. — bluish red; on dilution — bright orange brown
Aqueous solution + HCl conc. — bordeaux, ppt;
+ NaOH conc. — brownish orange (slightly redder)

25220 C.I. Direct Yellow 15 (Reddish yellow)

p-Nitroaniline $\xrightarrow{(1) \text{ Salicylic acid}}$
 $\xrightarrow{(2) \text{ reduce nitro group, condense with } p\text{-nitrobenzoyl chloride, reduce the nitro group} \rightarrow (3) \text{ 3-Carboxy-1-phenyl-5-pyrazolone}}$

Discoverer — H. Roos 1934

I.G., BP 451100; USP 2172712; FP 791599; GP 632135 (Fr. 23, 809)

FIAT 764 — Toluylengebl RL

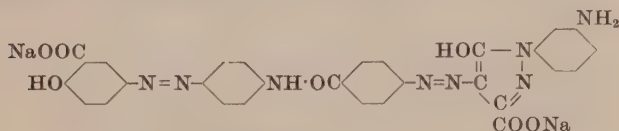
Moderately soluble in water (golden yellow)

Very slightly soluble in ethanol

H₂SO₄ conc. — golden orange; on dilution — yellowish brown

Aqueous solution + HCl conc. — golden yellow, ppt;

+ NaOH conc. — golden orange

25225 C.I. Direct Yellow 66 (Yellow)*

p-Nitroaniline $\xrightarrow{(1) \text{ Salicylic acid}}$
 $\xrightarrow{(2) \text{ reduce the nitro group, condense with } p\text{-nitrobenzoyl chloride, reduce the nitro group} \rightarrow (3) \text{ 3-Carboxy-1-(m-nitrophenyl)-5-pyrazolone;}}$
 and finally reduce the nitro group

Discoverer — H. Roos 1934

I.G., BP 445266; USP 2136757; FP 791671; GP 631184 (Fr. 23, 1179)

BP 451100; USP 2172712; FP 791599; GP 632135 (Fr. 23, 809)

FIAT 764 — Paragelb RL

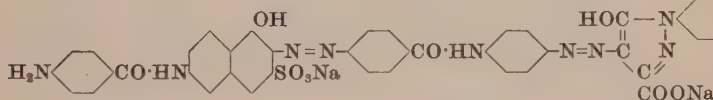
Moderately soluble in water (yellowish orange)

Almost insoluble in ethanol

H₂SO₄ conc. — orange; on dilution — pale yellow

Aqueous solution + HCl conc. — scarcely changed;

+ NaOH conc. — unchanged

* Coupled with diazotised *p*-nitroaniline**25240 C.I. Direct Red 141 (Bright red)***

4'-Amino-4-nitrobenzanilide $\xrightarrow{(2) \text{ reduce nitro group} \rightarrow (3) \text{ } N\text{-}p\text{-Aminobenzoyl J acid}}$
 $\xrightarrow{(1) \text{ 3-Carboxy-1-phenyl-5-pyrazolone}}$

Discoverer — H. Roos 1937

I.G., BP 451100; USP 2172691; FP 791599; GP 652871 (Fr. 24, 748)

BIOS 1548, 159

FIAT 764 — Diazobrillantscharlach ROL ex.

Very soluble in water (reddish orange brown)

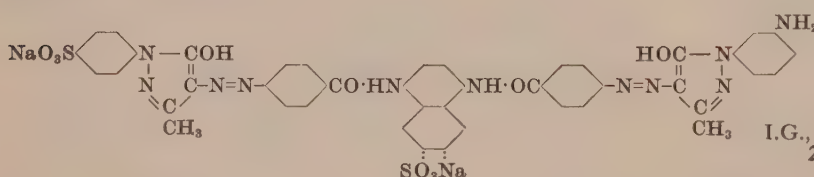
Slightly soluble in ethanol (brownish orange)

H₂SO₄ conc. — cherry red; on dilution — orange (reddish ppt.)

Aqueous solution + HCl conc. — red, ppt;

+ NaOH conc. — orange brown, ppt.

* Developed with 2-naphthol

25250 Direct Dye

5,8-Bis(*p*-aminobenzamido)-2-naphthalenesulfonic acid $\xrightarrow{(2) \text{ 3-Methyl-1-(}p\text{-sulfophenyl)-5-pyrazolone}}$
 $\xrightarrow{(1) \text{ 1-(}m\text{-Aminophenyl)-3-methyl-5-pyrazolone}}$

Discoverers — H. Clingstein, H. Roos and K. Heusner 1933

Diazo Fast Yellow 3G (IG)

Fastness Properties (C), developed with methyl-phenylpyrazolone: Acid (organic) 5, Alkali 4, Light 3, 4, 5, Washing 3, Water 4

Dischargeability: neutral, very good; alkaline, fair

I.G., BP 442778; USP 2028439; FP 776791; GP 620461 (Fr. 22, 1010)

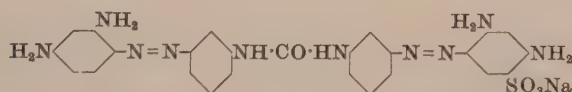
Very soluble in water (golden yellow)

Slightly soluble in ethanol (pale greenish yellow)

H₂SO₄ conc. — greenish yellow; on dilution — weaker

Aqueous solution + HCl conc. — golden yellow

+ NaOH conc. — golden yellow

25260 C.I. Direct Brown 146 (Brown)*

3,3'-Diaminocarbanilide $\xrightarrow{(2) \text{ } m\text{-Phenylenediamine}}$
 $\xrightarrow{(1) \text{ 2,4-Diaminobenzenesulfonic acid}}$

Discoverer — M. Kahn 1908

Bayer Co., BP 8416/09; USP 946050-1-2; FP 430208; GP 216685 (Fr. 9, 374)

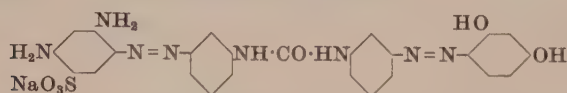
FIAT 764 — Parabraun G

Very slightly soluble in water (yellow brown) and ethanol (olive yellowish brown)

H₂SO₄ conc. — reddish orange brown; on dilution — yellow brown to orange brown

Aqueous solution + HCl conc. — brown, ppt;

+ NaOH conc. — olive brown ppt.

* Coupled with diazotised *p*-nitroaniline**25265 C.I. Direct Brown 148 (Brown)***

3,3'-Diaminocarbanilide $\xrightarrow{(1) \text{ 2,4-Diaminobenzenesulfonic acid}}$
 $\xrightarrow{(2) \text{ Resorcinol}}$

Discoverer — M. Kahn 1908

Bayer Co., BP 8416/09; USP 946050-1-2; FP 430208; GP 216685 (Fr. 9, 374)

FIAT 764 — Parabraun GK

Slightly soluble in water (yellowish brown) and ethanol

H₂SO₄ conc. — reddish orange brown; on dilution — yellow brown to orange brown

Aqueous solution + HCl conc. — reddish brown ppt;

+ NaOH conc. — yellow brown to orange brown; + NaOH dil. — no change

* Coupled with diazotised *p*-nitroaniline

25270 Direct Dye

3,3'-Diaminocarbanilide

 \Rightarrow M acid (5-Amino-1-naphthol-3-sulfonic acid) (2 mol.)*Discoverer* — P. Blumberger 1935**Diazo Rubine BD (IG)**

May be developed with 2-naphthol

I.G., BP 456756; USP 2128537; FP 805497; GP 667858 (Fr. 25, 687)

25275 C.I. Direct Red 120 (Bordeaux)*3,3'-Diaminocarbanilide \Rightarrow (alk.) J acid (2 mol.)

* Developed with 2-naphthol

Discoverers — M. Ulrich and K. Heidenreich 1901

Bayer Co., BP 11839/01; USP 678323; FP 311542; GP 134932 (Fr. 6, 969)

FIAT 764 — Diazorubin B

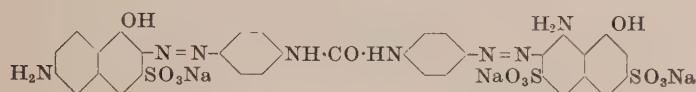
Soluble in water (orange brown)

Very slightly soluble in ethanol (orange)

H₂SO₄ conc. — red; on dilution — pale orange red

Aqueous solution + HCl conc. — reddish orange brown, ppt;

+ NaOH conc. — orange brown, ppt; + NaOH 10% — slightly yellow

25280 C.I. Direct Violet 83 (Bright violet)4,4'-Diaminocarbanilide $\begin{cases} \text{(alk.) J acid} \\ \text{(acid) H acid} \end{cases}$

Soluble in water (reddish violet) and in ethanol

Very soluble in Cellosolve

Insoluble in other organic solvents

H₂SO₄ conc. — violet; on dilution — dull bluish violet solution and ppt.Aqueous solution + H₂SO₄ 10% — no change;

+ NaOH 10% — bordeaux

25290 Direct Dye4,4'-Diaminocarbanilide \Rightarrow Naphthionic acid (2 mol.)*Discoverer* — C. L. Müller 1888**Salm Red (B) various brands**

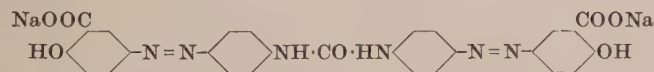
Badische Co., BP 14222/89; USP 430534; GP 50852 (Fr. 2, 452)

Soluble in water (orange yellow)

H₂SO₄ conc. — magenta red; on dilution — bluish violet ppt.

Aqueous solution + HCl — bluish violet ppt;

+ NaOH — unaltered, or soluble orange yellow ppt.

25300 C.I. Direct Yellow 26 (Yellow)(1) *p*-Nitroaniline \rightarrow Salicylic acid;
then reduce the nitro group(2) *p*-Aminoacetanilide \rightarrow Salicylic acid;
then hydrolyse the amide group

Finally phosgenate the resultant aminoazo compound from (1) or (2)

Aqueous solution + HCl conc. — dark brown, ppt;
+ NaOH conc. — brownish orange; + NaOH 10% — orange*Discoverer* — C. L. Müller 1888

Badische Co., BP 15258/88; USP 430535; GP 46737, 47902, (Fr. 2, 450, 453)

Nippon Chemical Industries, Jap. P 2687/52

FIAT 764 — Siriusgelb GG

Knecht, JSDC, 5 (1889) 107

Grandmougin & Guisan, Rev. gén. Mat. col. 12 (1908), 131

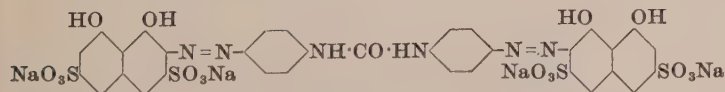
Bülow, Ber. 44 (1911), 605

Seyewetz & Chaix, Bull. Soc. chim. 41 (1927), 332

Stearns, Ind. Eng. Chem. (Anal.) 14 (1942), 568

Soluble in water (greenish yellow), ethanol and Cellosolve

Insoluble in other organic solvents

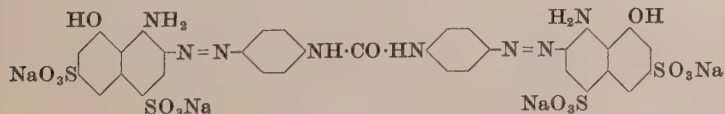
H₂SO₄ conc. — orange; on dilution — dull violet to blackHNO₃ conc. — violet solution, turns brown**25310 Direct Dye***p*-Nitroaniline \rightarrow Chromotropic acid;

reduce the nitro group then phosgenate the resultant aminoazo dye

Discoverer — R. J. Fletcher**Amidine Fast Heliotrope 2BL (JC)**

Amalgamated Dyestuff & Chemical Works, N.Y., USP 1617244

Soluble in water (bluish violet)

H₂SO₄ conc. — reddish violet**25315 C.I. Direct Green 55 (Dull bluish green)****p*-Nitroaniline \rightarrow (acid) K acid;

reduce the nitro group then phosgenate the resultant aminoazo compound

* Coupled with diazotised *p*-nitroaniline*Discoverers* — A. Blank and M. Latten 1910

Bayer Co., BP 30284/10; USP 1006051; FP 428410; GP 243685 (Fr. 10, 895)

FIAT 764 — Paralichtgruen B

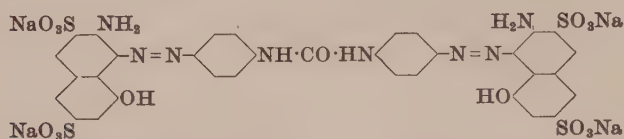
Soluble in water (dull bluish red)

Almost insoluble in ethanol

H₂SO₄ conc. — dark navy blue; on dilution — greenish blue

Aqueous solution + HCl conc. — dark navy blue, ppt;

+ NaOH conc. — reddish violet

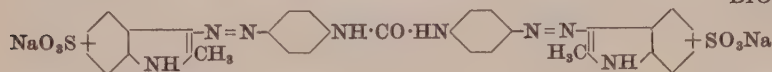
25320 C.I. Direct Red 101 (Bluish pink)

p-Nitroaniline → (acid) 2R acid;
reduce the nitro group then phosgenate the resultant aminoazo compound

Discoverer — E. Fussenegger 1912

Badische Co., USP 1076756; GP 275040 (Fr. 11, 421)
FIAT 764 — Siriusrosa G

Soluble in water (magenta red)
Very slightly soluble in ethanol
H₂SO₄ conc. — dark blue; on dilution — corinth
Aqueous solution + HCl conc. — violet, ppt;
+ NaOH conc. — red, ppt.

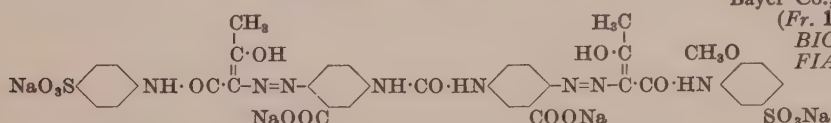
25325 C.I. Direct Yellow 13 (Dull yellow)

p-Aminoacetanilide → 2-Methylindolesulfonic acid;
hydrolyse the amide group then phosgenate the resultant aminoazo compound

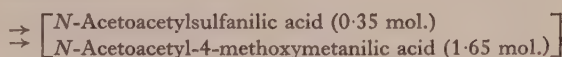
Discoverer — Bayer Co.

BIOS 1548, 146
FIAT 764 — Thiazolgelb GL

Soluble in water (golden yellow)
Moderately soluble in ethanol (olive yellow)
H₂SO₄ conc. — yellowish brown; on dilution — violet
Aqueous solution + HCl conc. — reddish brown, ppt;
+ NaOH conc. — golden orange

25340 C.I. Direct Yellow 69 (Yellow → Dull yellow)*

5,5'-Ureylenedianthranilic acid



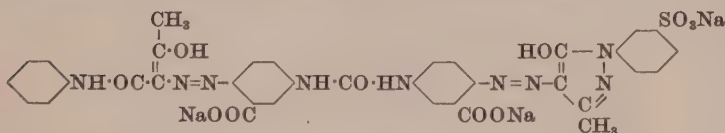
To prepare the coupling compound treat a mixed aqueous solution of the sodium salts of sulfanilic acid and 4-methoxymetanilic acid with diketene

* Aftertreated with copper sulfate

Discoverers — R. Stüsser, H. Roos, O. Müller and R. Pütter 1923
Bayer Co., BP 215769; USP 1560949; FP 581006; GP 409202
(Fr. 14, 994)

BIOS 1548, 103
FIAT 764 — Benzoehtkupfergelb GGL

Soluble in water (golden yellow)
Slightly soluble in ethanol
H₂SO₄ conc. — lemon yellow; on dilution — unchanged
Aqueous solution + HCl conc. — unchanged
+ NaOH conc. — unchanged

25345 C.I. Direct Orange 96 (Dull yellowish orange)*

5,5'-Ureylenedianthranilic acid
→ (2) Acetoacetanilide

→ (1) 3-Methyl-1-(*m*-sulfophenyl)-5-pyrazolone

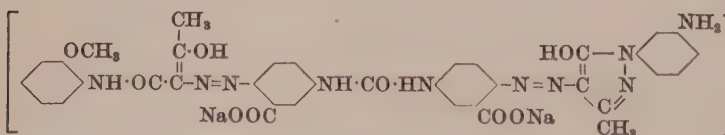
* Aftertreated with copper sulfate

Discoverer — R. Stüsser 1923

Bayer Co., BP 215769; USP 1560949; FP 581006; GP 409202
(Fr. 14, 994)

BIOS 1548, 104
FIAT 764 — Benzoehtkupfergelb RLN

Soluble in water (yellowish orange)
Slightly soluble in ethanol
H₂SO₄ conc. — reddish yellow; on dilution — little change
Aqueous solution + HCl conc. — yellowish orange, ppt;
+ NaOH conc. — unchanged

25350 Direct Dye

5,5'-Ureylenedianthranilic acid
→ *o*-Acetoacetanilide

→ 1-(*m*-Aminophenyl)-3-methyl-5-pyrazolone

then sulfonate the disazo dye

Discoverers — R. Stüsser 1923, R. Bauer 1931

Benzo Fast Copper Yellow RL (IG)

Fastness Properties (C), aftertreated with copper sulfate,
Acid (organic) 3, Alkali 4, Light 5-6, 6, 6-7:
Washing 4, Water 4-5
Dischargeability: neutral, poor; alkaline with anthraquinone,
good
(SO₃Na)_x

Bayer Co., BP 215769; USP 1560949; FP 581006; GP 409202
(Fr. 14, 994)

I.G., BP 396074; USP 1931836; FP 731158; GP 562644 (Fr. 19,
1732)
BIOS 1548, 104

Soluble in water (yellowish orange)
Slightly soluble in ethanol (pale orange brown)
H₂SO₄ conc. — golden yellow; on dilution — unchanged

Aqueous solution + HCl conc. — little change, ppt;
+ NaOH conc. — unchanged

25355 C.I. Direct Violet 81 (Dull violet)*

5-Nitroanthranilic acid \rightarrow (alk.) *N*-Phenyl J acid;
then reduce the nitro group and phosgenate the resultant aminoazo compound

*Aftertreated with copper sulfate

Discoverer — R. Stüsser 1923

Bayer Co., BP 215769; USP 1560949; FP 581006; GP 409202
(Fr. 14, 994)

BIOS 1548, 107

FIAT 764 — Benzoechtkupferviolett 3RL

Soluble in water (reddish violet)
Slightly soluble in ethanol
 H_2SO_4 conc. — bluish red; on dilution — violet
Aqueous solution + HCl conc. — violet, ppt;
+ NaOH conc. — reddish violet, ppt.

25370 C.I. Direct Brown 152 (Reddish brown)*

5,5'-Ureylenebis(2-aminobenzenesulfonic acid)
 \Rightarrow *m*-Phenylenediamine (2 mol.)

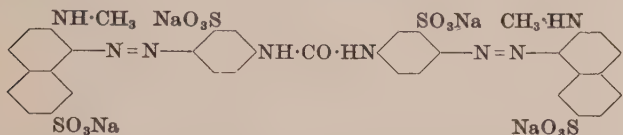
* Coupled with diazotised *p*-nitroaniline

Discoverer — O. Günther 1910

Bayer Co., BP 21200/10; USP 1019321; FP 432783; GP 259952
(Fr. 11, 414)

FIAT 764 — Paralichtbraun GR

Moderately soluble in water (golden yellow to orange) and in ethanol
 H_2SO_4 conc. — violet; on dilution — yellowish brown
Aqueous solution + HCl conc. — dark brown, ppt;
+ NaOH conc. — unchanged

25375 C.I. Direct Red 49 (Bluish pink)

5,5'-Ureylenebis(2-aminobenzenesulfonic acid)
 \Rightarrow (acid) 7-Methylamino-2-naphthalenesulfonic acid (2 mol.)

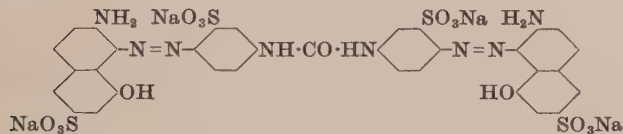
Discoverer — O. Günther 1910

Bayer Co., BP 21199/10; USP 1009740; FP 432729; GP 238856,
241227, (Fr. 10, 882, 822)

BIOS 1548, 148

FIAT 764 — Benzolichteosin BL

Soluble in water (red)
Slightly soluble in ethanol (brownish magenta)
 H_2SO_4 conc. — orange red brown; on dilution — violet grey
brown
Aqueous solution + HCl conc. — brown, ppt;
+ NaOH conc. — magenta

25380 C.I. Direct Red 75 (Bright bluish pink)

(1) 5,5'-Ureylenebis(2-aminobenzenesulfonic acid)
 \Rightarrow (acid) Gamma acid (2 mol.)

(2) 2-Amino-5-nitrobenzenesulfonic acid \rightarrow (acid) Gamma acid;
then reduce the nitro group and phosgenate the resultant aminoazo dye

Discoverers — M. Ulrich and C. Heidenreich 1900

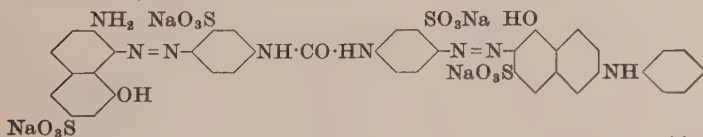
Bayer Co., BP 11766/01; USP 687171; FP 311339; GP 129388,
131513, (Fr. 6, 967, 968)

FIAT 764 — Siriusrosa BB

Z. Farb.-Ind. 1 (1902), 192

Chem. Z. 26 (1902), 485

Soluble in water (magenta red)
Slightly soluble in Cellosolve, very slightly soluble in ethanol
Insoluble in other organic solvents
 H_2SO_4 conc. — greyish blue; on dilution — violet
 HNO_3 conc. — partial solution (black)
Aqueous solution + HCl conc. — violet, ppt;
+ NaOH conc. — red, ppt.

25385 C.I. Direct Violet 6 (Bright reddish violet)

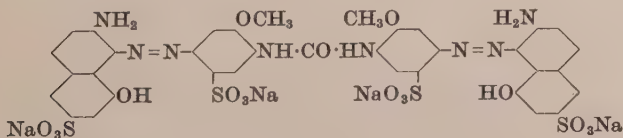
5,5'-Ureylenebis(2-aminobenzenesulfonic acid)
 $\begin{matrix} \nearrow (1) \text{ (acid) Gamma acid} \\ \searrow (2) \text{ (alk.) } N\text{-Phenyl J acid} \end{matrix}$

Discoverer — O. Günther 1910

Bayer Co., BP 21199/10; USP 1009740-1; GP 238856, 241227,
(Fr. 10, 882), GP ap. F31363 (Fr. 10, 900)

FIAT 764 — Brillantbenzoechtviolett 5RH

Soluble in water (magenta red)
Slightly soluble in ethanol
 H_2SO_4 conc. — corinth; on dilution — violet
Aqueous solution + HCl conc. — violet, ppt;
+ NaOH conc. — wine red, ppt.

25400 C.I. Direct Violet 62 (Bright reddish violet)

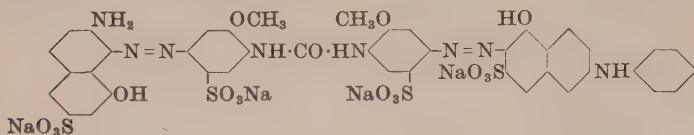
5-Acetamido-2-amino-4-methoxybenzenesulfonic acid
 \rightarrow (acid) Gamma acid;

then hydrolyse the amide group and phosgenate to form the urea

Discoverer — Agfa 1929

FIAT 764 — Siriuslichttrotviolett B

Soluble in water (reddish violet)
Very slightly soluble in ethanol
 H_2SO_4 conc. — bluish black; on dilution — violet
Aqueous solution + HCl conc. — violet, ppt;
+ NaOH conc. — wine red, ppt.

25405 Direct Dye

5,5'-Ureylenebis(2-amino-4-methoxybenzenesulfonic acid)
 (1) (acid) Gamma acid
 (2) (alk.) N-Phenyl J acid

Discoverer — Agfa

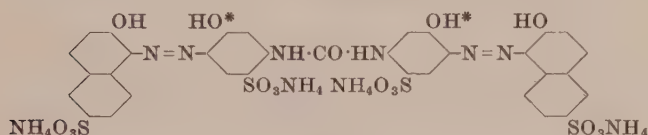
Solamine Violet 4R (A)

Fastness Properties (C): Acid (organic) 4, Alkali 5,
 Light 4-5, 5, 5, Washing 2, Water 1-2

Soluble in water (reddish violet)
 Slightly soluble in ethanol
 H₂SO₄ conc. — bluish black; on dilution — violet
 Aqueous solution + HCl conc. — violet
 + NaOH conc. — reddish violet

25410 C.I. Direct Violet 47 (Reddish violet)

Bis copper complex derived from the disazo dye



Reduce the nitro group in the monoazo dye

4-Methoxy-6-nitrometanilic acid → Schaeffer's acid;
 then phosgenate to form the urea. Finally boil with aqueous copper sulfate,
 isolate and convert to the ammonium salt

* During the coppering process the two methoxy groups are probably
 exchanged for hydroxy groups

Discoverers — H. Krzikalla 1926 and K. Wiedemann 1931

I.G., BP 269819; USP 1765680; FP 638722; GP 474997 (Fr. 16, 968)

BIOS 1548, 128

FIAT 764 — Siriuslichtrotviolett RL

Standard

Russia GOST 9528-60 (Fast Light Violet 2K)

Soluble in water (reddish violet)
 Very slightly soluble in ethanol
 H₂SO₄ conc. — magenta red; on dilution — reddish brown
 Aqueous solution + HCl conc. — wine red, ppt; + H₂SO₄
 10% — no change + NaOH dil. — no change; + NaOH
 conc. — red, ppt.

25420 C.I. Direct Violet 80 (Bluish violet → Reddish blue)*

(2-Amino-5-nitrophenoxy)acetic acid → N-p-Methoxyphenyl J acid;
 reduce the nitro group then phosgenate the resultant aminoazo compound

* Aftertreated with copper sulfate

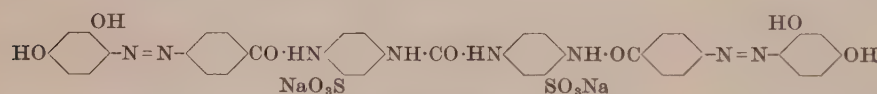
Discoverers — D. Delfs and R. Stüsser 1938

I.G., USP 2212590; FP 852131; GP 741467 (Fr.-Bayer, I-1, 1229)

BIOS 1548, 109

FIAT 764 — Benzoechtkupferviolett F3BL

Soluble in water (violet)
 Slightly soluble in ethanol
 H₂SO₄ conc. — violet; on dilution — bright violet
 Aqueous solution + HCl conc. — blue;
 + NaOH conc. — bordeaux

25430 Direct Dye

5,5'-Ureylenebis[2-(p-aminobenzamido)benzenesulfonic acid]
 ⇌ Resorcinol (2 mol.)

Aqueous solution + HCl conc. — orange red brown, ppt;
 + NaOH conc. — reddish brown, largely ppt.

Discoverers — A. Blank, C. Heidenreich and J. Jansen 1912

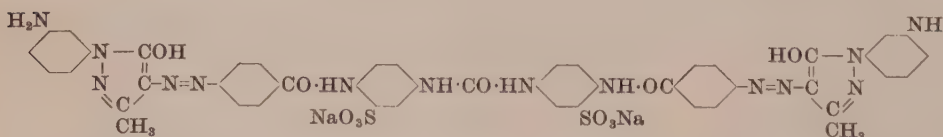
Benzoform Orange G (By)

Fastness Properties (C), aftertreated with
 formaldehyde: Acid (organic) 2, Alkali 3,
 Light 2, 2, 3, Washing 3, Water 3
 Dischargeability: fairly good

Bayer Co., BP 19989/12; USP 1082924-5; FP 456674; GP 269849 (Fr. 11, 426)

FIAT 764 — Benzoformorange G

Moderately soluble in water (yellow brown)
 Slightly soluble in ethanol (pale yellowish olive)
 H₂SO₄ conc. — orange brown; on dilution — yellowish brown

25435 Direct Dye

5,5'-Ureylenebis[2-(p-aminobenzamido)benzenesulfonic acid]
 ⇌ 1-(m-Aminophenyl)-3-methyl-5-pyrazolone (2 mol.)

Aqueous solution + HCl conc. — hue unchanged, ppt;
 + NaOH conc. — reddish yellow, largely ppt.

Discoverers — H. Jordan and W. Neelmeier 1913

Benzoform Yellow GL (By)

Fastness Properties (C), aftertreated
 with formaldehyde: Acid (organic) 5;
 Alkali 3, Light 3, 4, 4, Washing 2-3,
 Water 3
 Dischargeability, good

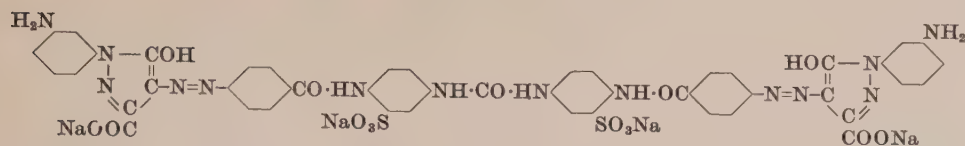
Bayer Co., BP 3557/14; USP 1147803; FP 475068; GP 289350 (Fr. 12, 339; GP 301599 (Fr. 13, 525)

FIAT 764 — Benzoformgelb GL

Moderately soluble in water (reddish yellow)
 Almost insoluble in ethanol
 H₂SO₄ conc. — lemon yellow; on dilution — reddish yellow

25440 C.I. Direct Orange 85 (Bright yellowish orange)*

Discoverer — H. Roos 1934

I.G., BP 443778; USP 2129964; FP 791338; GP 629812 (Fr. 23, 811)
FIAT 764 — Diazobrillantorange 3G5,5'-Ureylenebis[2-(*p*-aminobenzamido)benzenesulfonic acid]
⇌ 3-Carboxy-1-(*m*-nitrophenyl)-5-pyrazolone (2 mol.);

then reduce the two nitro groups

* Developed with 2-naphthol

Soluble in water (golden orange)

Very slightly soluble in ethanol

H₂SO₄ conc. — greenish yellow; on dilution — pale orange

Aqueous solution + HCl conc. — brownish orange, ppt;

+ NaOH conc. — greenish yellow

25450 Direct Dye

4,4'-Diaminothiocarbanilide ⇌ Naphthionic acid (2 mol.)

Discoverers — Prager and Istel 1890

Noetzel, Istel & Co., GP 58204, 60152, (Fr. 3, 31, 32)

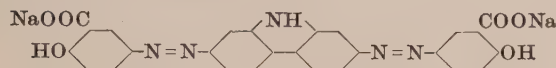
Salmon Red (NI)

Soluble in water (orange red)

H₂SO₄ conc. — magenta red; on dilution — bluish violet ppt.

Aqueous solution + HCl — bluish violet ppt;

+ NaOH — unaltered

25700 Direct Dye

2,7-Diaminocarbazole ⇌ Salicylic acid (2 mol.)

Discoverer — R. Bohn 1888

Carbazol Yellow (B)

Applied to cotton it is sensitive to dilute acid and alkali.

May be applied to chrome-mordanted wool

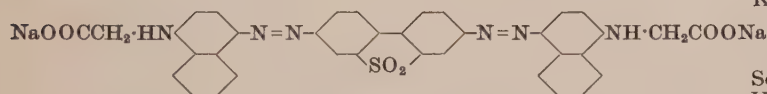
Badische Co., BP 14478-9/88; USP 401634; FP 193212; GP 46438

(Fr. 2, 447)

Knecht, JSDC, 5 (1889), 107

Aqueous solution + HCl — dark brown ppt;
+ NaOH — orange yellow

Soluble in water (brownish yellow)

H₂SO₄ conc. — violet blue; on dilution — dark brown, ppt.**25720 Direct Dye**3,7-Diaminobiphenylene sulfone ⇌ *N*-1-Naphthylglycine (2 mol.)**Glycine Blue (Ki)**

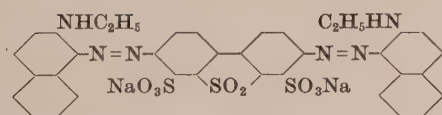
Kinzlberger & Co., BP 21949/91; GP 74775 (Fr. 3, 707)

Soluble in water (bordeaux red) and ethanol (bluish red)

H₂SO₄ conc. — blue; on dilution — violet ppt.

Aqueous solution + HCl — violet ppt;

+ NaOH — red ppt.

25730 Acid Dye3,7-Diamino-4,6-disulfobiphenylene sulfone
⇌ *N*-Ethyl-2-naphthylamine (2 mol.)

Discoverer — C. Duisberg 1885

Brilliant Sulfon Azurine R (By)

Bayer Co., USP 499216; FP 200091; GP 51497 (Fr. 2, 408)

FIAT 764 — Brillantsulfonazurin R

Duisberg & Griess, Ber. 22 (1889), 2459

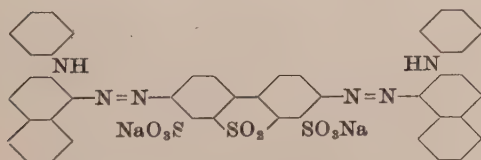
Note — The positions of the sulfonic acid groups are not exactly fixed

Not very soluble in water (reddish blue); soluble in ethanol (deep blue)

H₂SO₄ conc. — corinth; on dilution — weak corinth

Aqueous solution + HCl conc. — violet grey, ppt;

+ NaOH conc. — blue, ppt.

25735 C.I. Acid Blue 85 (Reddish navy)3,7-Diamino-4,6-disulfobiphenylene sulfone
⇌ *N*-Phenyl-2-naphthylamine (2 mol.)

Discoverers — P. Griess 1883; C. Duisberg 1885

Bayer Co., BP 1074/84, 1099/84; USP 423550, 432989; GP 27954, 33088, (Fr. 1, 495, 498)

FIAT 764 — Sulfonazurin

Soluble in water (blue) and ethanol (violet blue)

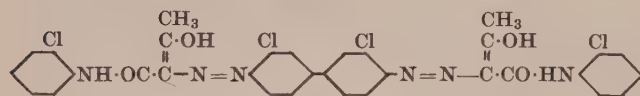
H₂SO₄ conc. — bordeaux; on dilution — greyish violet

Aqueous solution + HCl conc. — dull blue, ppt;

+ NaOH conc. — blue

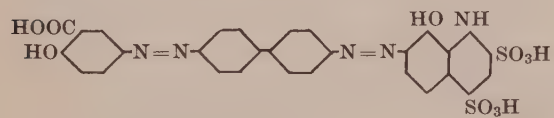
ADDENDA

21091 C.I. Pigment Yellow 63 (*Greenish yellow*)



3,3'-Dichlorobenzidine \rightleftharpoons *o*-Chloroacetanilide (2 mol.)

22322 C.I. Direct Green 21:1



Benzidine $\begin{cases} \nearrow (1) \text{ Salicylic acid} \\ \searrow (2) (alk) \text{ Chicago acid} \end{cases}$

NOTES

DISAZO DYES — III

DYES OF GENERAL FORMULA: $A \rightarrow M \rightarrow E$

The dyes of this constitution are sometimes known as secondary Disazo dyes. They include a small number of water-insoluble dyes, dealt with first, which belong to the Disperse and Solvent usage sections.

The water-soluble dyes for the most part are either Acid dyes of relatively high fastness to wet treatments, ranging in hue from scarlet to reddish blue, navy blue and black, or are Direct dyes typically level dyeing but of somewhat low affinity and ranging in hue from red to reddish blue. This section also contains a few Mordant dyes. There are dyes of outstanding commercial importance among the navy blue and black Acid dyes.

The succession is based primarily on the end component (E), i.e. the second coupling component, which in this section often determines the general dyeing properties, secondly on the middle component (M) and finally on the diazo component (A).

The dyes fall into the following groups —

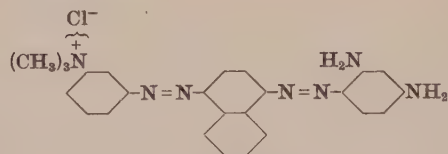
| <i>C.I. Numbers</i> | <i>Nature of "E" Component</i> | <i>Typical Application Classes</i> | <i>Number of Dyes Contained</i> |
|--|---|---|---------------------------------|
| Dyes without $-\text{COOH}$, $-\text{SO}_3\text{H}$ or $-\text{SO}_2\text{NH}_2$ salt-forming groups | | | |
| 26000–26150 | Various | Disperse and Solvent | 18 |
| Water-soluble dyes carrying $-\text{COOH}$, $-\text{SO}_3\text{H}$ or $-\text{SO}_2\text{NH}_2$ groups | | | |
| 26200–26440 | Arylamine | Acid, especially of navy blue and black hue. The small number of Direct dyes have <i>m</i> -phenylenediamine or a derivative as E | 30 |
| 26500–26580 | Phenol, Resorcinol, or derivatives | Mainly Mordant. In Direct dyes the phenol residue is esterified or etherified | 13 |
| 26650–26785 | 1-Naphtholsulfonic acid | Acid and Direct dyes, mostly red in hue. In this area the direct dyeing properties depend upon the choice of components A or M. A few black Mordant dyes are included | 22 |
| 26900–27311 | 2-Naphthol or 2-Naphtholsulfonic acid | Mainly Acid in various shades of red. The small number of Direct dyes are of the developing class and give trisazo dyes on the fibre. A few Mordant dyes, green or black, are included | 62 |
| 27500–27560 | Dihydroxynaphthalenesulfonic acid | Acid | 7 |
| 27600–27790 | Aminonaphtholsulfonic acid (usually J acid or Gamma acid) | Direct red, violet, grey and, when developed on the fibre, blue and black; only exceptionally Acid or Mordant | 20 |
| 27850–27990 | Arylamino-naphtholsulfonic acid (all are derivatives of J acid) | Direct violet, blue and, exceptionally, green | 21 |
| 28100–28500 | Acylamino(or aroylamino)naphthol-sulfonic acid | Direct, usually of red or violet hue; green dyes are included but in most cases only attain this shade when diazotised and developed on the fibre. There is a small group of Mordant dyes designed for chrome printing on cellulosic fibres | 51 |
| 28650–28725 | Pyrazolone or other heterocyclic compound | Direct, orange from pyrazolones and red or violet from hydroxynaphthimidazole, hydroxynaphthotriazole or hydroxynaphthothiazole | 12 |
| TOTAL | | | 256 |

26000

Basic Dye

Janus Violet (A)

FIAT 764 — Janusviolett

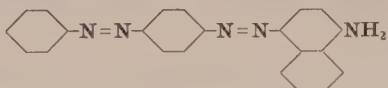


(*m*-Aminophenyl)trimethylammonium chloride
→ 1-Naphthylamine → *m*-Phenylenediamine

26020

C.I. Solvent Orange 14 (Dull reddish orange)

Discoverers — R. Nietzki and J. Diesterweg 1888

Nietzki & Diesterweg, *Ber.* 21 (1888), 2146

p-Phenylazoaniline → 1-Naphthylamine

Insoluble in water

Soluble in ethanol, acetone and benzene

H₂SO₄ conc. — orange; on dilution — yellowish orange

26030

C.I. Solvent Red 29 (Dull bordeaux)



1-Naphthylamine → 1-Naphthylamine → 1-Naphthylamine

Insoluble in water

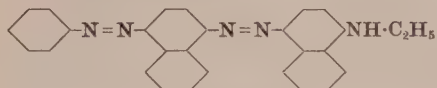
Soluble in ethanol

Very soluble in acetone and benzene

H₂SO₄ conc. — reddish brown; on dilution — bright yellowish brown

26040

C.I. Solvent Black 4



Aniline → 1-Naphthylamine → *N*-Ethyl-1-naphthylamine

Insoluble in water

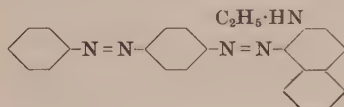
Soluble in ethanol, acetone and benzene

H₂SO₄ conc. — yellowish maroon; on dilution — greenish yellow

26050

C.I. Solvent Red 19 (Bright bluish red)

FIAT 764 — Sudanrot 7B



p-Phenylazoaniline → *N*-Ethyl-2-naphthylamine

Soluble in ethanol (carmine)

Very soluble in acetone and benzene

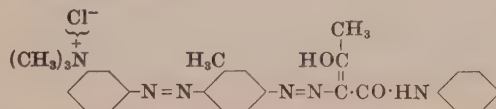
H₂SO₄ conc. — brilliant greenish blue; on dilution — bluish violet to bordeaux

26060

Basic Yellow

Janus Yellow G (A)

FIAT 764 — Janusgelb G



(*m*-Aminophenyl)trimethylammonium chloride
→ *m*-Toluidine → Acetoacetanilide

26070

C.I. Disperse Yellow 23 (Reddish yellow)

S.R.A. Fast Golden Yellow XIII (BrC)

Brit. Celanese BP 298842; USP 2072252



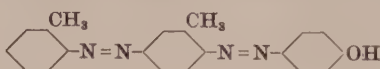
p-Phenylazoaniline → Phenol

H₂SO₄ conc. — violet; on dilution — brown ppt.

NaOH 10% — orange

26075

C.I. Solvent Orange 13 (Bright yellowish orange)



4-*o*-Tolylazo-*o*-toluidine → Phenol

Insoluble in water; soluble in NaOH dil.

Soluble in ethanol and benzene

H₂SO₄ conc. — violet, becoming brownish red; on dilution — yellowish orange

26080

C.I. Disperse Orange 13 (Yellowish orange)

C.I. Solvent Orange 52 (Reddish orange)

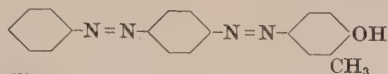


Aniline → 1-Naphthylamine → Phenol

Soluble in ethanol, acetone, Cellosolve and benzene

Slightly soluble in carbon tetrachloride

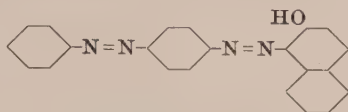
H₂SO₄ conc. — dull greenish blue; on dilution — dull green then brown

26090 C.I. Disperse Yellow 7 (Reddish yellow)*p*-Phenylazoaniline → *o*-Cresol

Discoverer — I.G. 1935

BIOS 961, 77

FIAT 764 — Celliton Fast Yellow 5R

26100 C.I. Solvent Red 23 (Yellowish red)*p*-Phenylazoaniline → 2-Naphthol

Note — Some commercial products are made from mixtures of *p*-phenylazoaniline and its homologues and are e.g. composed of C.I.26100 and C.I.26105

Discoverer — F. Grässler

Rumpff & Grässler, BP 5003/79; FP 134802

Krügener, GP 16482 (Fr. 1, 443)

FIAT 764 — Sudan Red BK

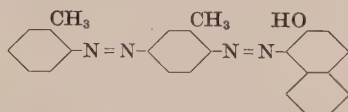
Nietzki, Ber. 13 (1880), 800, 1838

Rowe & Levin, JSDC, 40 (1924), 226

Recrystallised from ethanol — brown plates with green metallic lustre, m.p. 195°C

Soluble in ethanol and acetone

Very soluble in benzene

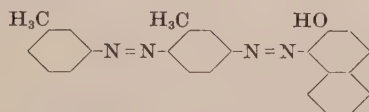
H₂SO₄ conc. — bluish green; on dilution — blue solution, then red ppt.**26105 C.I. Solvent Red 24 (Red)**4-*o*-Tolylazo-*o*-toluidine → 2-Naphthol

FIAT 764 — Sudan Red BB

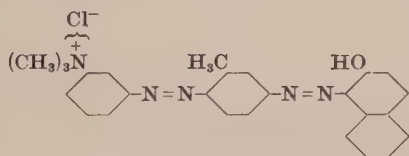
M.p. 184–185°C

Soluble in ethanol and acetone

Very soluble in benzene

H₂SO₄ conc. — bluish green; on dilution — red ppt.**26110 C.I. Solvent Red 25 (Red)**4-*m*-Tolylazo-*m*-toluidine → 2-Naphthol

FIAT 764 — Sudanrot B

26115 Basic Red

(*m*-Aminophenyl)trimethylammonium chloride
→ *m*-Toluidine → 2-Naphthol

Discoverer — E. König 1896

Janus Red B (A)

M.L.B., BP 5119/97; USP 623697; FP 264579; GP 93499, 93936, (Fr. 4, 819, 822), 99755 (Fr. 5, 559)

FP 264962; GP 95718 (Fr. 5, 556)

USP 602637; GP 98585 (Fr. 5, 545)

BP 10596/98; FP 264599; GP 100919 (Fr. 5, 560)

FIAT 764 — Janusrot B

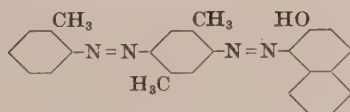
Liebert, JSDC, 14 (1898), 222

Soluble in water and ethanol (red)

H₂SO₄ conc. — green; on dilution — red ppt.

Aqueous solution + HCl — brownish red flocculent ppt;

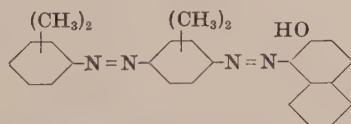
+ NaOH — bluish violet ppt.

26120 C.I. Solvent Red 26 (Red)*o*-Toluidine → 2,5-Xylylidine → 2-NaphtholH₂SO₄ conc. — bluish green; on dilution — red ppt.H₂SO₄ 10% — insoluble

HCl conc. — insoluble

HNO₃ conc. — brown solution

NaOH 10% — insoluble

26125 C.I. Solvent Red 27 (Bluish red)

Xylylazoxylidine → 2-Naphthol

Note — For Sudan Red 5B (IG) the xylylazoxylidine was a mixed product obtained from technical mixed xylylides (80%) and mixed toluidines (20%)

FIAT 764 — Sudanrot 5B

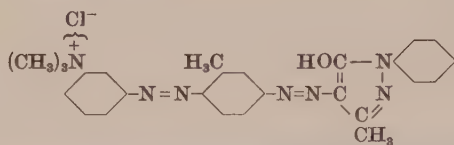
Evenson, J. Assoc. Off. Agric. Chem. 27 (1944), 572

Soluble in ethanol (yellowish red) and acetone

Very soluble in benzene

H₂SO₄ conc. — greenish blue; on dilution — bluish violet, ppt.

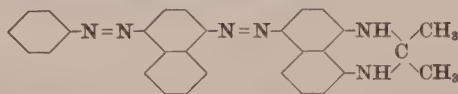
26140 Basic Yellow



(*m*-Aminophenyl)trimethylammonium chloride → *m*-Toluidine
→ 3-Methyl-1-phenyl-5-pyrazolone

Janus Yellow R (A)
FIAT 764 — Janusgelb R

26150 C.I. Solvent Black 3 (Black)

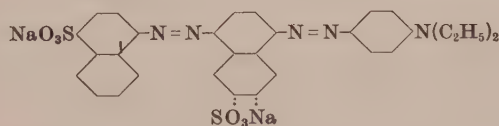


Aniline → 1-Naphthylamine → 2,3-Dihydro-2,2-dimethylperimidine

Badische Co., GP 278079 (*Fr.* 11, 1197)
FIAT 764 — Sudanschwarz BN, BT, 413

Soluble in ethanol, acetone and toluene
H₂SO₄ conc. — purplish black; on dilution — dull greenish blue,
blue to black ppt.
Ethanol solution + HCl conc. — bluish black;
+ NaOH conc. — dull blue

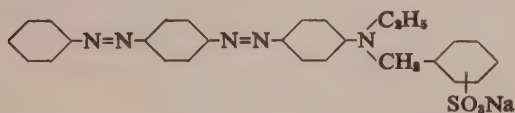
26200 Acid Dye



Naphthionic acid → 1,6(and 1,7)-Cleve's acid
→ *N,N*-Diethylaniline

Discoverer — Badische Co.
Diethyl Black (B)

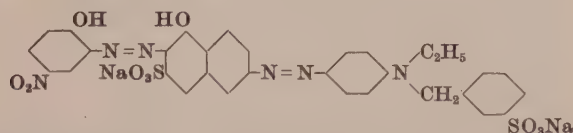
26207 C.I. Acid Red 350 (Yellowish red)



p-Phenylazoaniline → α -(*N*-ethylanilino)toluenesulfonic acid

Soluble in hot water (red)
Very soluble in methanol and 2-ethoxyethanol
H₂SO₄ conc. Reddish Orange on diln blue
HCl + aq soln Violet
NaOH + aq soln Red
CH₃COOH Dull Red

26210 Mordant Dye

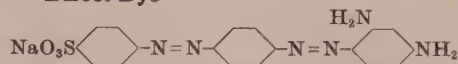


2-Amino-4-nitrophenol → J acid
→ α -(*N*-Ethylanilino)-*m*-toluenesulfonic acid

Discoverer — Agfa 1915
Chrome Fast Black BBL (By)
Agfa, GP 293657 (*Fr.* 13, 501)

Soluble in water (deep violet)
Moderately soluble in ethanol (magenta red)
H₂SO₄ conc. — olive green; on dilution — corinth
Aqueous solution + HCl conc. — bordeaux;
+ NaOH conc. — corinth

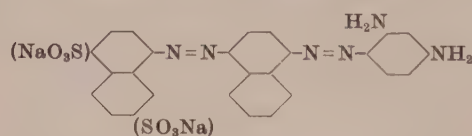
26220 Direct Dye



p-(*p*-Aminophenylazo)benzenesulfonic acid → *m*-Phenylenediamine

This constitution is attributed in *C.I.310 (1st Ed.)* to **Benzo Brown D3G extra (By)** and other dyes. Actually Benzo Brown D3G extra is a trisazo dye (**C.I.30045**) and it is improbable that any of the commercial dyes mentioned in *C.I.310 (1st Ed.)* has this constitution

26230 C.I. Direct Brown 67 (Reddish brown)



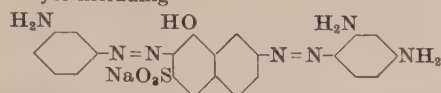
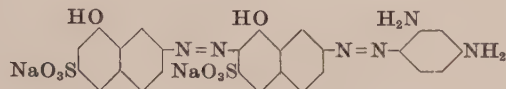
Naphthionic acid (90%) }
1,7-Cleve's acid (10%) } → 1-Naphthylamine
→ *m*-Phenylenediamine

Discoverer — Bayer Co. 1887
FIAT 764 — Baumwollbraun A

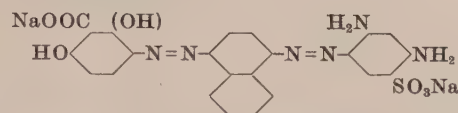
Soluble in water (orange brown)
Slightly soluble in ethanol (yellowish orange brown)
H₂SO₄ conc. — dark bluish black; on dilution — brown
Aqueous solution + HCl conc. — brown ppt;
+ NaOH conc. — orange brown, ppt.

26240 Direct Dye

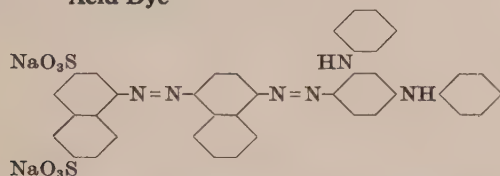
Mixtures of dyes including

*m*-Aminooxanilic acid→ (alk.) Gamma acid—hydrolyse oxamic acid group
→ *m*-Phenylenediamine**Para Brown R (By)**Soluble in water (brownish violet) and ethanol (reddish violet)
H₂SO₄ conc. — brownish violet; on dilution — reddish yellow
Aqueous solution + HCl — reddish brown ppt;
+ NaOH conc. — brownish violet, ppt.**26245 Direct Dye**Gamma acid → (alk.) Gamma acid → *m*-Phenylenediamine

Discoverer — Bayer Co. 1911

Para Brown M (By)Moderately soluble in water (reddish brown)
Slightly soluble in ethanol (pale violet grey)
H₂SO₄ conc. — violet grey to black; on dilution — pale reddish brown
Aqueous solution + HCl conc. — brown ppt;
+ NaOH conc. — bordeaux**26260 Mordant Dye**3(and 5)-Aminosalicylic acid → 1-Naphthylamine
→ 2,4-Diaminobenzenesulfonic acid

Discoverers — K. Krekeler and C. Hagemann 1899

Diamond Brown 3R (By) An afterchrome dyeBayer Co., BP 8299/89; USP 438438; FP 198521; GP 51504
(Fr. 2, 325)Soluble in water (orange red brown)
Moderately soluble in ethanol (magenta red)
H₂SO₄ conc. — olive green; on dilution — corinth
Aqueous solution + HCl conc. — brown;
+ NaOH conc. — bordeaux**26270 Acid Dye**4-Amino-2,7-naphthalenedisulfonic acid → 1-Naphthylamine
→ *N,N'*-Diphenyl-*m*-phenylenediamine

Discoverer — D. A. Rosenstiehl 1889

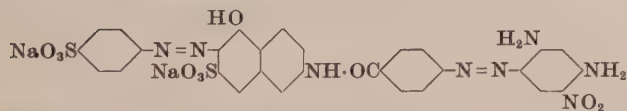
Anthracite Black B (C)

Dyes wool in the presence of acetic acid

S. A. St. Denis, BP 4825/89; USP 502912; FP 196793; GP 52616
(Fr. 2, 322)

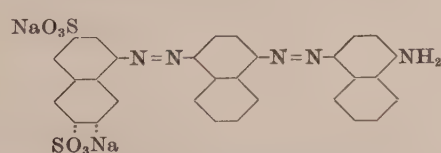
Cassella Co., BP 7977/89; FP 197963; GP 61201 (Fr. 3, 549)

Anthracite Black B —

Soluble in water (violet black) and in ethanol (navy blue)
H₂SO₄ conc. — blackish blue; on dilution — olive brown (soluble) ppt; then blue solution
Aqueous solution + HCl — brownish olive solution and soluble blue ppt; + NaOH — violet red ppt.**26280 C.I. Direct Orange 3 (Bright orange)**Sulfanilic acid → *N-p*-Aminobenzoyl J acid
→ 4-Nitro-*m*-phenylenediamine

M.L.B., FP 454171; GP 267042 (Fr. 11, 433)

FIAT 764 — Dianilorange GS

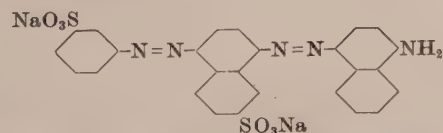
Soluble in water (orange)
Moderately soluble in ethanol (golden yellow to orange)
H₂SO₄ conc. — red; on dilution — golden orange
Aqueous solution + HCl conc. — golden orange;
+ NaOH conc. — brownish orange**26300 C.I. Acid Black 7 (Black)**4-Amino-2,6(and 2,7)-naphthalenedisulfonic acid
→ 1-Naphthylamine → 1-Naphthylamine

Discoverer — A. Weinberg 1888

Cassella Co., BP 18425/88; USP 412440; FP 170342; GP 50907

(Fr. 2, 316)

FIAT 764 — Naphthylaminschwarz D

Soluble in water and ethanol (corinth)
H₂SO₄ conc. — greyish blue to black; on dilution — weak reddish violet ppt.
Aqueous solution + HCl conc. — corinth;
+ NaOH conc. — corinth**26305 Acid Dye**

Metanilic acid → 1,7-Cleve's acid → 1-Naphthylamine

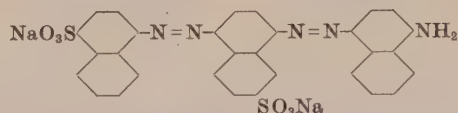
Discoverer — A. Blank 1902

Naphthalene Acid Black 4B (By)

Dyes wool and silk in the presence of acetic acid. Good fastness to light and washing

FIAT 764 — Wollschwarz R

Naphthalene Acid Black 4B —
Soluble in water (reddish violet)
H₂SO₄ conc. — blue; on dilution — violet
Aqueous solution + HCl — blue; + NaOH — red

26310 C.I. Acid Black 27 (Brownish black)

Naphthionic acid → 1,7-Cleve's acid → 1-Naphthylamine

Discoverers — K. Elbel, F. Kreke, and I. Rosenberg 1891

Patent Black N (K)

Kalle Co., *USP* 546068/9; *GP* 73901 (*Fr.* 3, 552)

FIAT 764 — Patentschwarz N

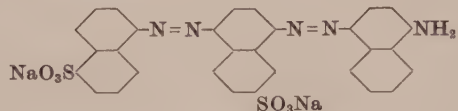
Soluble in water (corinth)

Slightly soluble in ethanol

H₂SO₄ conc. — bluish black; on dilution — corinth;

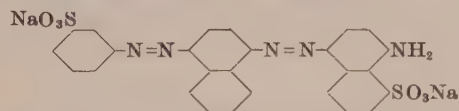
Aqueous solution + HCl conc. — corinth;

+ NaOH conc. — corinth

26315 Acid Dye

5-Amino-1-naphthalenesulfonic acid → 1,7-Cleve's acid
→ 1-Naphthylamine

Discoverer — Bayer Co. 1910

Sulphon Cyanine Black 2206 (By)**26320 C.I. Acid Black 35 (Reddish black)**

Metanilic acid → 1-Naphthylamine → Peri acid

Sulphon Black RA (G)

Bayer Co., *BP* 1851/92; *FP* 227222; *GP* 96083 (*Fr.* 4, 740)

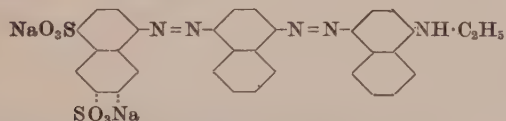
Moderately soluble in water (violet black)

Slightly soluble in ethanol (violet)

H₂SO₄ conc. — greenish blue; on dilution — corinth

Aqueous solution + HCl conc. — corinth, ppt;

+ NaOH conc. — bordeaux

26330 Acid Dye

4-Amino-1,6(and 1,7)-naphthalenedisulfonic acid
→ 1-Naphthylamine → *N*-Ethyl-1-naphthylamine

Naphthyl Blue Black N

Dyes wool in the presence of acetic acid and silk in the boil-off liquor broken with acetic acid

Fastness Properties: Light, moderate to good; Perspiration, moderate; Washing, moderate to good

Cassella Co., *GP* 71329 (*Fr.* 3, 551)

FIAT 764 — Naphthylblauschwarz N

JSDC, 12 (1896), 68

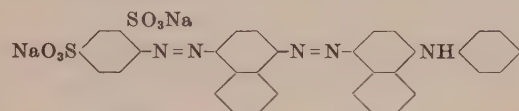
Chem. Ind. 19 (1896), 548

Slightly soluble in water and ethanol (violet)

H₂SO₄ conc. — dark blue; on dilution — blue to pale blue

Aqueous solution + HCl conc. — blue;

+ NaOH conc. — reddish violet

26340 Acid Dye

4-Amino-*m*-benzenedisulfonic acid → 1-Naphthylamine
→ *N*-Phenyl-1-naphthylamine

Discoverer — M. Kahn 1888

Jet Black R (By)

Dyes wool in the presence of acetic acid or salt, moderately fast to light and milling, and silk in the boil-off liquor broken with acetic acid. Sensitive to copper

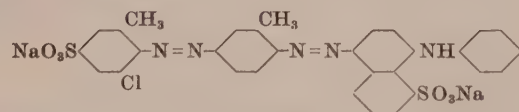
Bayer Co., *BP* 14442/88; *USP* 425885; *FP* 193430; *GP* 48924 (*Fr.* 2, 317)

Knecht, *JSDC*, 5 (1889), 106

Aqueous solution + HCl — bluish black ppt;
+ NaOH — soluble bluish violet ppt.

Soluble in water (bluish violet)

H₂SO₄ conc. — blue; on dilution — greenish blue, ppt.

26350 Acid Dye

4-Amino-5-chloro-*m*-toluenesulfonic acid
→ *o*-Toluidinomethanesulfonic acid
—hydrolyse methanesulfonic acid group
→ *N*-Phenyl Peri acid

Sulphon Violet R extra (By)

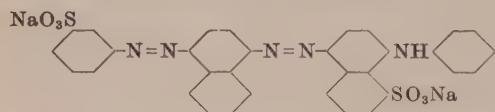
Bayer Co., *GP* 75771 (*Fr.* 4, 717)

Soluble in water and ethanol (reddish violet)

H₂SO₄ conc. — blue; on dilution — violet blue

Aqueous solution + HCl conc. — violet blue, ppt;

+ NaOH conc. — bordeaux, ppt.

26360 C.I. Acid Blue 113 (Reddish navy)

Metanilic acid → 1-Naphthylamine → *N*-Phenyl Peri acid

Discoverer — P. Ott 1892

Bayer Co., *GP* 118655 (*Fr.* 5, 958, 6, 847), 122065 (*Fr.* 6, 848)

FIAT 764 — Sulfoncyanin 5R ex.

Rowe & Dangerfield, *JSDC*, 52 (1936), 55

Soluble in water (violet), ethanol (violet blue) and Cellosolve

Slightly soluble in acetone

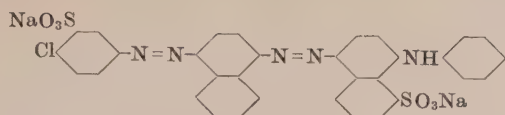
Insoluble in other organic solvents

H₂SO₄ conc. — dullish greenish blue; on dilution — dark

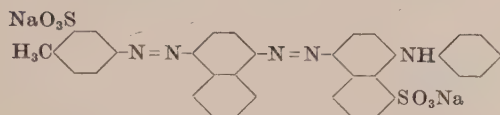
greenish blue to greyish violet

HNO₃ conc. — orange brown solution

Aqueous solution + HCl conc. — corinth;
+ NaOH conc. — bordeaux

26361 C.I. Acid Blue 114 (Navy)

6-Chlorometanilic acid → 1-Naphthylamine → *N*-Phenyl Peri acid

26365 Acid Dye

5-Amino-*o*-toluenesulfonic acid → 1-Naphthylamine
→ *N*-Phenyl Peri acid

Discoverer — Cassella Co.

Alphanol Blue 10R (C)

Dyes of similar constitution —

Bayer Co., GP 118655, 122065, (Fr. 6, 847, 848)

26370 C.I. Acid Black 24 (Bluish black)

5-Amino-1-naphthalenesulfonic acid → 1-Naphthylamine
→ *N*-Phenyl Peri acid

Aqueous solution + HCl conc. — greenish blue;
+ NaOH conc. — bordeaux

Discoverer — A. Blank 1902

Bayer Co., GP 118655 (Fr. 5, 958, 6, 847); GP 122065 (Fr. 6, 848)

FIAT 764 — Sulfoncyaninschwarz BB

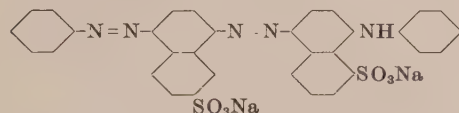
Soluble in water (reddish blue to black), ethanol (navy blue) and Cellosolve

Slightly soluble in acetone

Insoluble in other organic solvents

H₂SO₄ conc. — greyish blue to black; on dilution — dull greenish blue

HNO₃ conc. — reddish brown becoming yellower

26380 C.I. Acid Blue 116 (Reddish navy)

Aniline → 1,7-Cleve's acid → *N*-Phenyl Peri acid

Discoverer — P. Ott 1892

Bayer Co., GP 118655 (Fr. 5, 958, 6, 847), 122065 (Fr. 6, 848)

FIAT 764 — Sulfoncyanin 3R

Soluble in water (violet), ethanol (deep blue) and acetone

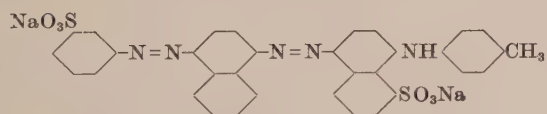
Slightly soluble in Cellosolve

Insoluble in other organic solvents

H₂SO₄ conc. — dullish blue; on dilution — blue

HNO₃ conc. — yellow brown solution

Aqueous solution + HCl conc. — dullish blue;
+ NaOH conc. — corinth

26400 C.I. Acid Blue 120 (Reddish navy)

Metanilic acid → 1-Naphthylamine → *N*-*p*-Tolyl Peri acid

Discoverer — P. Ott 1892

Bayer Co., GP 118655 (Fr. 5, 958, 6, 847), 122065 (Fr. 6, 848)

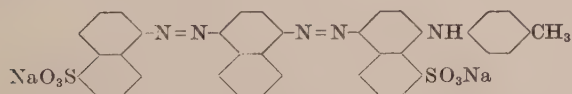
FIAT 764 — Sulfoncyanin GR ex.

Soluble in water (violet) and ethanol (deep blue)

H₂SO₄ conc. — dullish deep blue; on dilution — greenish blue

Aqueous solution + HCl conc. — dull blue, ppt;

+ NaOH conc. — corinth

26405 C.I. Acid Black 21 (Black)

5-Amino-1-naphthalenesulfonic acid → 1-Naphthylamine
→ *N*-*p*-Tolyl Peri acid

Discoverer — A. Blank 1902

Bayer Co., GP 118655 (Fr. 5, 958, 6, 847), 122065 (Fr. 6, 848)

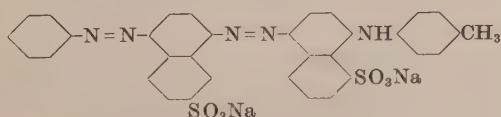
FIAT 764 — Sulfoncyaninschwarz 8B

Soluble in water (dullish violet) and ethanol (reddish blue)

H₂SO₄ conc. — bluish black; on dilution — bluish green

Aqueous solution + HCl conc. — turquoise blue;

+ NaOH conc. — corinth, ppt.

26410 C.I. Acid Blue 118 (Navy)

Aniline → 1,7-Cleve's acid → *N*-*p*-Tolyl Peri acid

Discoverer — P. Ott 1892

Bayer Co., GP 118655 (Fr. 5, 958, 6, 847), 122065 (Fr. 6, 848)

FIAT 764 — Sulfoncyanin G

Rowe & Dangerfield, JSDC, 52 (1936), 56

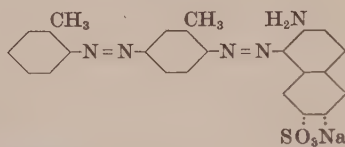
Soluble in water (dark navy blue) and ethanol (deep blue)

H₂SO₄ conc. — deep blue; on dilution — greenish blue

Aqueous solution + HCl conc. — greenish blue, ppt;

+ NaOH conc. — dark violet, ppt.

26420 C.I. Acid Red 104 (Red)

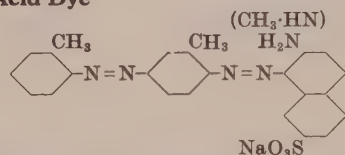


4-*o*-Tolylazo-*o*-toluidine
→ 6(and 7)-Amino-2-naphthalenesulfonic acid

Discoverer — C. Duisberg 1888
FIAT 764 — Tuchrot' 3G ex.

Slightly soluble in water (brownish red)
Moderately soluble in ethanol (orange red) and Cellosolve
Insoluble in most other organic solvents
H₂SO₄ conc. — deep blue; on dilution — weak orange, brown ppt.
Aqueous solution + HCl conc. — orange brown;
+ H₂SO₄ 10% — weaker red;
+ NaOH conc. — brownish orange red

26430 Acid Dye



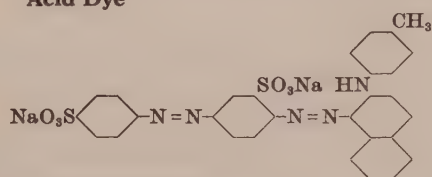
4-*o*-Tolylazo-*o*-toluidine → equimolecular mixture of
7-Amino- and 7-Methylamino-2-naphthalenesulfonic acids

Discoverers — H. Hassenkamp and C. Duisberg 1886
Cloth Red 3B extra (By)

Dyes wool neutral or in the presence of acid. Can also be dyed by metachrome or chrome-mordant methods

Slightly soluble in water (wine red)
Moderately soluble in ethanol (red)
H₂SO₄ conc. — deep blue; on dilution — weak reddish brown
Aqueous solution + HCl conc. — reddish brown, ppt;
+ NaOH conc. — wine red to bordeaux, ppt.

26435 Acid Dye



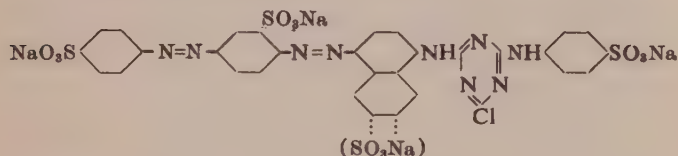
6-Amino-3,4'-azodibenzene sulfonic acid
→ *N-p*-Tolyl-2-naphthylamine

Discoverer — L. Schad 1885
Wool Black (A)

Dyes wool in the presence of acid
Agfa, BP 9754/86; USP 354746; GP 38425 (Fr. 1, 418)
Witt, Ber. 20 (1887), 579

Soluble in water (bluish violet)
H₂SO₄ conc. — blue; on dilution — brown ppt. On boiling decomposition occurs with formation of 6-amino-3,4'-azodibenzene sulfonic acid and 10-methylbenzo[*a*]phenazine (Witt)
Aqueous solution + HCl — reddish violet
+ NaOH — violet ppt.

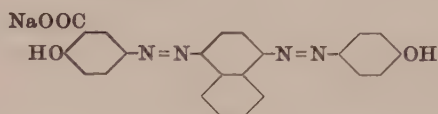
26440 C.I. Reactive Brown 1 (Brown)



Sulfanilic acid → *o*-Aminobenzenesulfonic acid
→ 1:6 (and 1:7) Cleve's acid,
then condense with Cyanuric chloride and with Sulfanilic acid

Panchartek, Allan and Mužík, Coll. Czech. Chem. Commun.,
25 (1960) 2783-2799
Austrian Pat. 202,242

26500 Mordant Dye

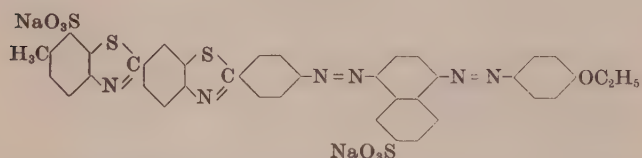


5-Aminosalicylic acid → 1-Naphthylamine → Phenol

Discoverers — K. Krekeler and R. Lauch 1889
Salicinbraun RC (By)
Bayer Co., GP 51504 (Fr. 2, 325)

Moderately soluble in water (yellowish brown) and ethanol (golden yellow)
H₂SO₄ conc. — olive green; on dilution — brownish olive yellow
Aqueous solution + HCl conc. — yellowish brown, ppt;
+ NaOH conc. — bordeaux

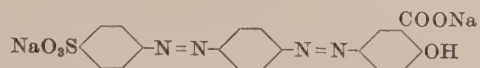
26510 Direct Dye



Primuline (C.I.49000) → 1,6-Cleve's acid → Phenol;
then ethylate the hydroxy group

Discoverer — W. A. Israel 1893
Chloramine Brown G (By)

Fastness Properties (C): Acid (organic) 3, Alkali 3,
Light 5, Washing 1-2, Water 2
Dischargeability: neutral and alkaline, poor
Bayer Co., BP 2591/94; FP 221233; GP 86420 (Fr. 4, 843)
FIAT 764 — Chloraminbraun G
Soluble in water (orange brown)
Insoluble in ethanol
H₂SO₄ conc. — dullish bluish green; on dilution — orange brown
Aqueous solution + HCl conc. — brown ppt;
+ NaOH conc. — orange brown ppt.

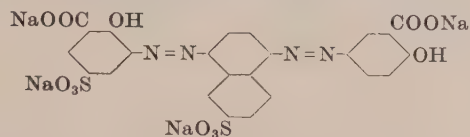
26520 C.I. Mordant Orange 6 (Dull reddish orange)

p-(*p*-Aminophenylazo)benzenesulfonic acid → Salicylic acid

Aqueous solution + HCl conc. — pale brownish yellow;
+ NaOH conc. — reddish orange brown

Discoverer — R. Nietzki 1890
FP 206755
FIAT 764 — Chromorange GR

Soluble in water (yellow to orange)
Slightly soluble in ethanol and acetone
H₂SO₄ conc. — reddish violet; on dilution — pale yellowish orange
HCl conc. — violet, decolorised on standing

26530 C.I. Mordant Brown 51 (Reddish brown)

3-Amino-5-sulfosalicylic acid → 1,6-Cleve's acid → Salicylic acid

Discoverers — W. Neelmeier, T. Nocken and W. Rebner 1925
I.G., USP 1643222; FP 615218; GP 443522 (Fr. 15, 516)
BIOS 1548, 99. FIAT 764 — Azoldruckbraun 3RL

Soluble in water (golden orange)
Insoluble in ethanol
H₂SO₄ conc. — greenish blue; on dilution — golden yellow
Aqueous solution + HCl conc. — yellow brown to olive;
+ NaOH conc. — violet

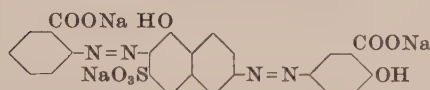
26531 C.I. Acid Brown 146 (Bordeaux)*

A chromium complex of C.I.26530

Heat C.I.26530 with aqueous chromium formate at 85–90°C so as to introduce one atom of chromium for each salicylic acid residue

* On leather

Discoverer — I.G.
FIAT 764 — Erganilrotbraun C

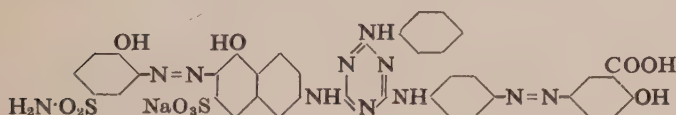
26540 C.I. Direct Red 186 (Dull bordeaux)*

Anthranilic acid → (alk.) J acid → Salicylic acid

* With chromium salts

Discoverers — W. Neelmeier and R. Fischer 1923
Bayer Co., GP 408294 (Fr. 14, 1091)
FIAT 764 — Chromsogarot 29851

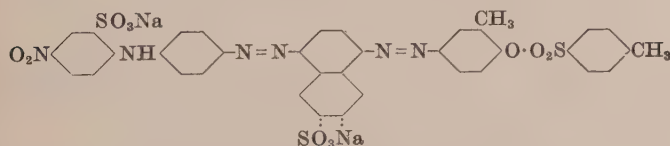
Very soluble in water (red)
Moderately soluble in ethanol
H₂SO₄ conc. — dark blue; on dilution — weak reddish orange to brown
Aqueous solution + HCl conc. — reddish brown ppt;
+ NaOH conc. — reddish brown

26545 C.I. Direct Red 181 (Dull yellowish red)

Condense cyanuric chloride with 2-amino-1-phenol-4-sulfonamide → J acid then with C.I. 14045, and finally with aniline

Coprantine Brown 6RLL . . . CIBA

Panchartek, Allan and Mužik, Coll. Čech. Chem. Commun.,
25 (1960) 2783–2799

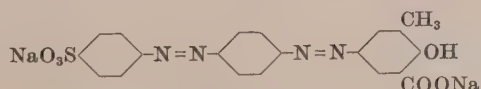
26550 C.I. Acid Orange 51 (Reddish orange)

2-(*p*-Aminoanilino)-5-nitrobenzenesulfonic acid
→ 1,6(and 1,7)-Cleve's acid → *o*-Cresol;

then esterify with *p*-toluenesulfonyl chloride

Discoverer — I.G. 1935
BIOS 961, 65
FIAT 764 — Supranolbraun 4R (error for 5R)

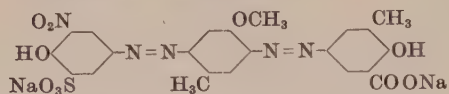
Soluble in water (brown) and ethanol
Very soluble in Cellosolve
H₂SO₄ conc. — dark bluish green; on dilution — brown ppt.
HNO₃ conc. — olive solution, turns greenish amber
Aqueous solution + HCl conc. — bluish black ppt;
+ NaOH conc. — brown

26560 C.I. Mordant Orange 10 (Dull reddish orange)

p-(*p*-Aminophenylazo)benzenesulfonic acid → 2,3-Cresotic acid

26565 C.I. Mordant Red 80 (Dull red)

Discoverer — Cassella Co. 1899



4-Amino-6-nitro-1-phenol-2-sulfonic acid
→ Cresidine → 2,3-Cresotic acid

Soluble in water (orange brown)
Very slightly soluble in ethanol (pale pink)
H₂SO₄ conc — deep blue; on dilution — pale yellowish olive
Aqueous solution + HCl conc — brownish yellow;
+ NaOH conc. — bordeaux

26570 Direct Dye

Discoverer — O. Günther 1912

Benzoform Red GGF (By)

Fastness Properties (C), aftertreated with formaldehyde:
Acid (organic) 3, Alkali 5, Light 2, Washing 2-3,
Water 2

Bayer Co., BP 19843/12; USP 1074429; FP 458374; GP ap.
F34556 (Fr. 11, 428)
FIAT 764 — Benzoformrot GGF

o-Anisidine → *N*-*m*-(*p*-Aminobenzamido)benzoyl J acid → Resorcinol

Aqueous solution + HCl conc. — orange brown ppt;
+ NaOH conc. — reddish orange brown ppt.

Moderately soluble in water (reddish orange brown)
Very slightly soluble in ethanol
H₂SO₄ conc. — brownish violet and green; on dilution — orange brown

26575 Direct Dye

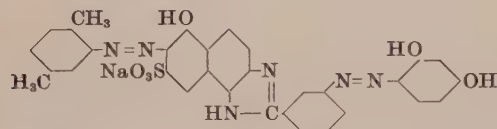
Discoverer — O. Günther 1912

Benzoform Scarlet B (By)

Fastness Properties (C), aftertreated with formaldehyde:
Acid (organic) 3, Alkali 3, Light 2, 3, 3, Washing 2-3,
Water 2-3

Dischargeability, fair

Bayer Co., BP 19843/12; USP 1074429; FP 458374; GP ap.
F34556 (Fr. 11, 428)
FIAT 764 — Benzoformscharlach B



2,5-Xylidine
→ 2-(*m*-Aminophenyl)-6-hydroxy-1*H*-naphth[1,2]-
imidazole-8-sulfonic acid → Resorcinol

Aqueous solution + HCl conc. — wine red ppt;
+ NaOH conc. — reddish orange brown, ppt.

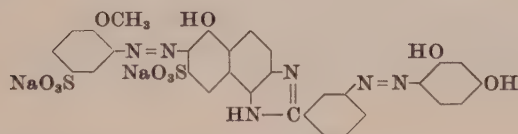
Moderately soluble in water and ethanol (scarlet)
H₂SO₄ conc. — magenta; on dilution — scarlet

26580 Direct Dye

Discoverer — K. Heusner 1912

Benzoform Scarlet BWM (By)

Bayer Co., BP 19843/12; USP 1074429; FP 458374; GP ap.
F34556 (Fr. 11, 428)



4-Methoxymetanilic acid
→ 2-(*m*-Aminophenyl)-6-hydroxy-1*H*-naphth[1,2]-
imidazole-8-sulfonic acid → Resorcinol

Discoverers — H. Jordan and W. Neelmeier 1910

Bayer Co., BP 7422/11; USP 1000269; FP 429774; GP 253286
(Fr. 11, 424)

BIOS 1548, 179
FIAT 764 — Diazoreinblau 3GL

Slightly soluble in water (corinth to violet black)
Soluble in ethanol (blue)

H₂SO₄ conc. — bluish green; on dilution — blue to bluish violet,
ppt.

Aqueous solution + HCl conc. — dark violet ppt;
+ H₂SO₄ 10% — no change;
+ NaOH conc. — dull dark violet ppt;
+ NaOH 10% — no change

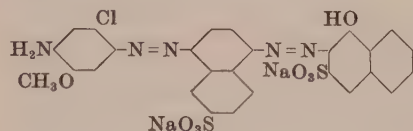
Discoverer — O. N. Witt 1883

Ver. Chem. Fab. (Mannheim), BP 2237/83; GP 26012 (Fr. 1, 391)
Paul, GP 28820 (Fr. 1, 447)

Badische Co., BP 10363/07; USP 863396; FP 378274; GP 198103
(Fr. 9, 421)

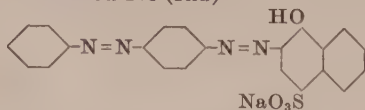
BIOS 1548, 49. FIAT 764 — Tuchrot G. This is a mixed dye
in which C.I.26660 is only one component. See C.I.27190

Slightly soluble in water (magenta red)
Moderately soluble in ethanol (red)
H₂SO₄ conc. — deep blue; on dilution — weak reddish orange

26650 C.I. Direct Blue 138 (Blue)*

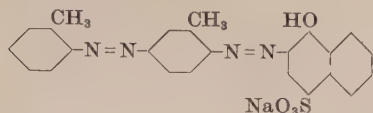
4-Amino-5'-chloro-2-methoxyoxanilic acid → 1,6-Cleve's acid
→ 1-Naphthol-3-sulfonic acid;
then hydrolyse the oxamic acid group

* Developed with 2-naphthol

26660 C.I. Acid Red 116 (Red)

p-Phenylazoaniline → Nevile and Winther's acid

Aqueous solution + HCl conc. — reddish brown ppt;
+ NaOH conc. — bordeaux

26665 C.I. Acid Red 148 (Bluish red)

4-*o*-Tolylazo-*o*-toluidine → Nevile and Winther's acid

Discoverer — R. Krügener 1879

M.L.B., BP 536/80; GP 16482 (*Fr.* 1, 443)

Rumpff & Grässler, BP 5003/79

Ver. Chem. Fab. (Mannheim), BP 2237/83; GP 26012 (*Fr.* 1, 391)

Paul, GP 28820 (*Fr.* 1, 447)

Badische Co., BP 1036307; USP 863396; FP 378274; GP 198103 (*Fr.* 9, 421)

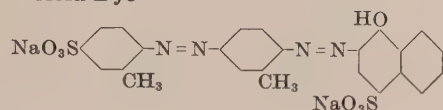
FIAT 764 — Tuchrot B

Aqueous solution + HCl conc. — reddish brown, ppt;
+ NaOH conc. — wine red to bordeaux ppt.

Slightly soluble in water

Moderately soluble in ethanol (red)

H₂SO₄ conc. — deep blue; on dilution — weak reddish orange

26670 Acid Dye

4-(4-Amino-*m*-tolylazo)-*m*-toluenesulfonic acid
→ Nevile and Winther's acid

Discoverer — O. N. Witt 1883

Orseiline BB (By)

Dyes wool in the presence of acid, moderately fast to light and milling

Ver. Chem. Fab. (Mannheim), BP 2237/83; GP 26012 (*Fr.* 1, 391)

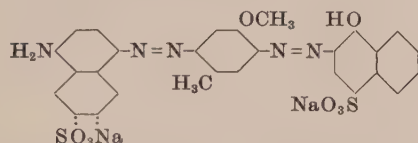
FIAT 764 — Litholbordo BN Tg

Soluble in water (wine red) and ethanol (magenta red)

H₂SO₄ conc. — deep blue; on dilution — wine red

Aqueous solution + HCl conc. — reddish brown;

+ NaOH conc. — bordeaux

26680 C.I. Direct Blue 111 (Dull greenish blue)

4-Nitro-1,6(and 1,7)-Cleve's acid → Cresidine
→ Nevile and Winther's acid;
then reduce the nitro group to amino

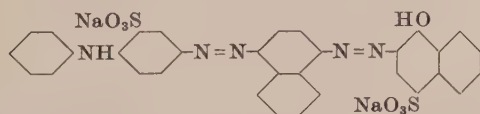
Soluble in water (violet to blue)

Insoluble in ethanol

H₂SO₄ conc. — bluish black; on dilution — violet blue

HCl conc. — bordeaux solution; on dilution — violet blue

NaOH conc. — insoluble, dull blue solution on dilution

26690 C.I. Acid Black 26:2 (Navy → Bluish black)

5-Amino-2-anilinobenzenesulfonic acid → 1-Naphthylamine
→ Nevile and Winther's acid

Agfa, BP 24527/97; FP 271609; GP 101274 (*Fr.* 5, 514)

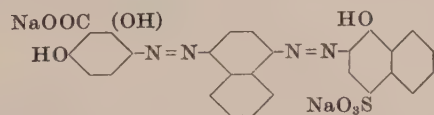
Soluble in water (reddish navy blue) and ethanol

Very slightly soluble in ethanol

H₂SO₄ conc. — bluish black; on dilution — turbid navy blue

Aqueous solution + H₂SO₄ 10% — bottle green;

+ Na₂CO₃ 10% — little effect

26695 C.I. Mordant Black 5 (Reddish black)

3(and 5)-Aminosalicylic acid → 1-Naphthylamine
→ Nevile and Winther's acid

Discoverers — K. Krekeler and R. Lauch 1889

Bayer Co., BP 8299/89; USP 438438; FP 198521; GP 51504 (*Fr.* 2, 325)

Walker, JSDC, 28 (1912), 15

Brenner, *Helv. Chim. Acta*, 3 (1920), 98

Soluble in water (dark violet)

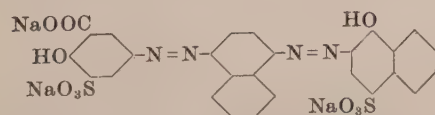
Slightly soluble in ethanol and acetone

H₂SO₄ conc. — dark green; on dilution — violet

HNO₃ conc. — dull red becoming orange

Aqueous solution + HCl conc. — corinth;

+ NaOH conc. — dark blue to bluish black

26700 Mordant Dye

5-Amino-3-sulfosalicylic acid → 1-Naphthylamine
→ Nevile and Winther's acid

Discoverers — H. Dean and J. Turner 1899

Chrome Black I (H)

Dyes chromed wool fast black

Read Holliday & Sons, BP 2468/99; FP 293923; GP 123115

(*Fr.* 6, 171)

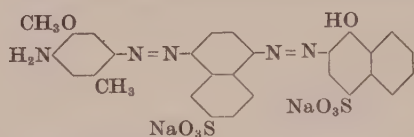
Soluble in water (reddish violet)

H₂SO₄ conc. — bluish green; on dilution — violet

Aqueous solution + HCl — crimson;

+ NaOH — blue

26705 C.I. Direct Blue 123 (Dull blue → Navy)*



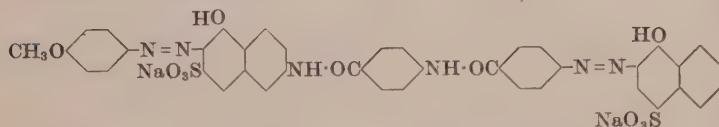
4-Amino-5'-methyl-*o*-acetanisidide → 1,6-Cleve's acid
→ Nevile and Winther's acid;
then hydrolyse the amide group

* Developed with 2-naphthol

Discoverers — H. Jordan, W. Neelmeier, and K. Heusner 1914
Bayer Co., *USP* 1169344; *GP* 290436 (*Fr.* 12, 347)
FIAT 764 — Diaminogenreinblau N

Soluble in water (navy blue to violet black)
Slightly soluble in ethanol (blue)
 H_2SO_4 conc. — deep blue; on dilution — violet
Aqueous solution + HCl conc. — violet ppt;
+ $NaOH$ conc. — navy blue

26715 Direct Dye



p-Anisidine → *N*-*p*-(*p*-Aminobenzamido)benzoyl J acid
→ Nevile and Winther's acid

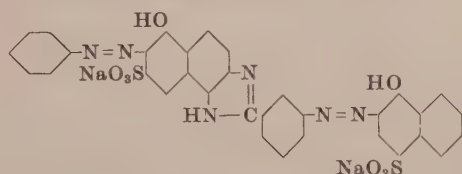
Discoverer — W. Neelmeier 1910

Benzo Fast Scarlet 4FB (By)

Bayer Co., *BP* 14735/10; *USP* 994420; *FP* 428138, 428101;
GP 240827, 230595, (*Fr.* 10, 193, 915)

Soluble in water (brownish orange red)
Slightly soluble in ethanol (orange red)
 H_2SO_4 conc. — reddish violet; on dilution — brownish red
orange
Aqueous solution + HCl conc. — brownish orange red;
+ $NaOH$ conc. — brownish orange

26720 C.I. Direct Red 57 (Bright yellowish red)



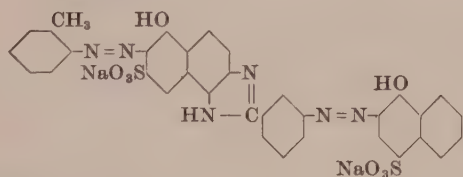
Aniline
→ 2-(*m*-Aminophenyl)-6-hydroxy-1*H*-naphth[1,2]imidazole-8-sulfonic acid
→ Nevile and Winther's acid

Discoverer — A. Schedler 1906

Ciba, *BP* 12461/06; *USP* 837736; *GP ap.* G23113-4 (*Fr.* 9, 400-1)
FIAT 764 — Diaminechtscharlach GFF

Soluble in water (orange red to scarlet)
Moderately soluble in ethanol (brownish orange)
 H_2SO_4 conc. — magenta red; on dilution — orange
Aqueous solution + HCl conc. — red ppt;
+ $NaOH$ conc. — orange brown

26725 Direct Dye



o-Toluidine
→ 2-(*m*-Aminophenyl)-6-hydroxy-1*H*-
naphth[1,2]imidazole-8-sulfonic acid
→ Nevile and Winther's acid

Discoverer — Ciba 1906

Columbia Fast Scarlet S5B (A)

Fastness Properties (C): Acid (organic) 4, Alkali 5,
Light 3, Washing 1-2, Water 1-2

Dischargeability: neutral and alkaline, fair

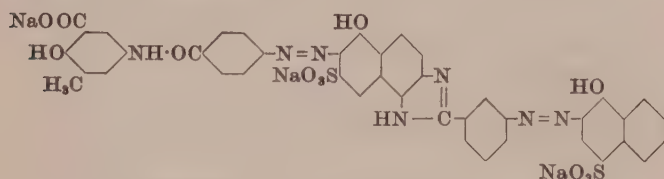
In **Columbia Fast Scarlet S8B (A)** half of the *o*-toluidine
was replaced by *o*-anisidine

BP 12421/96; *USP* 837736; *GP ap.* G23113, G23114, (*Fr.* 9,
400, 401)

FIAT 764 — Columbiaechtscharlach S5B

Soluble in water (red)
Moderately soluble in ethanol (reddish orange)
 H_2SO_4 conc. — magenta red; on dilution — reddish orange
Aqueous solution + HCl conc. — red ppt;
+ $NaOH$ conc. — brownish orange

26730 Direct Dye

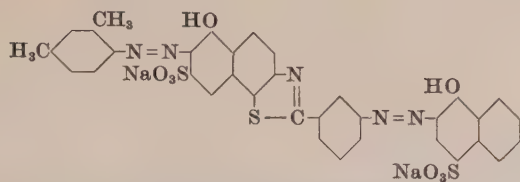


5-(*p*-Aminobenzamido)-2,3-cresotic acid
→ 2-(*m*-Aminophenyl)-6-hydroxy-1*H*-
naphth[1,2]imidazole-8-sulfonic acid
→ Nevile and Winther's acid

Benzo Fast Scarlet 6BS (By)

Bayer Co., *GP* 366530 (*Fr.* 14, 990)

Soluble in water (red)
Very slightly soluble in ethanol (pale reddish brown)
 H_2SO_4 conc. — magenta; on dilution — red
Aqueous solution + HCl conc. — red, ppt;
+ $NaOH$ conc. — reddish orange brown

26735 Direct Dye

2,4-Xylidine → 2-(*m*-Aminophenyl)-6-hydroxy-naphtho[2,1]thiazole-8-sulfonic acid
→ Neville and Winther's acid

Discoverer — A. Thauss 1904

Benzo Fast Scarlet 8FB (By)

Fastness Properties (C): Acid (organic) 4, Alkali 5, Light 2, Washing 1-2, Water 1-2

Dischargeability: neutral and alkaline, fair

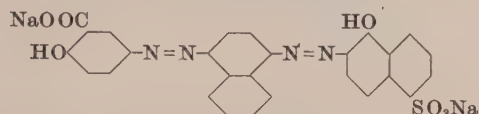
Bayer Co., *USP* 794568, 795869; *FP* 355046, 353928; *GP* 165126, 166903, (*Fr.* 8, 186, 695)

Soluble in water (red)

Slightly soluble in ethanol (orange red)

H₂SO₄ conc. — magenta; on dilution — pale reddish orange

Aqueous solution + HCl conc. — magenta, ppt;
+ NaOH conc. — brownish orange, ppt.

26750 C.I. Mordant Black 62 (Black)

5-Aminosalicylic acid → 1-Naphthylamine
→ 1-Naphthol-5-sulfonic acid

Aqueous solution + HCl conc. — pale reddish brown;
+ NaOH conc. — violet black

Discoverers — K. Krekeler and R. Lauch 1889

Bayer Co., *BP* 8299/89; *USP* 438438; *FP* 198521; *GP* 51504 (*Fr.* 2, 325)

FIAT 764 — Salicinschwarz DE konz.

Soluble in water (violet black)

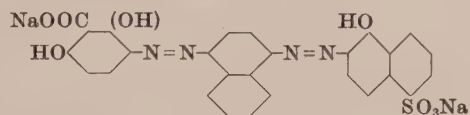
Moderately soluble in ethanol (corinth)

Slightly soluble in acetone

Insoluble in most other organic solvents

H₂SO₄ conc. — leaf green; on dilution — pale reddish brown

HNO₃ conc. — dullish red, turns orange

26751 C.I. Mordant Black 68 (Black)

3(and 5)-Aminosalicylic acid → 1-Naphthylamine
→ 1-Naphthol-5-sulfonic acid

Discoverers — K. Krekeler and R. Lauch 1889

Bayer Co., *BP* 8299/89; *USP* 438438; *FP* 198521; *GP* 51504 (*Fr.* 2, 325)

FIAT 764 — Diamantschwarz FB, Salicinschwarz D

Walker, *JSDC*, 28 (1912), 15

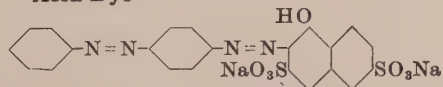
Brenner, *Helv. Chim. Acta*, 3 (1920), 98

Soluble in water (dark violet)

Moderately soluble in ethanol

H₂SO₄ conc. — bluish green; on dilution — pale corinth

Aqueous solution + HCl conc. — corinth;
+ NaOH conc. — navy blue

26760 Acid Dye

p-Phenylazoaniline → 1-Naphthol-3,6-disulfonic acid
(In some brands a mixture of 1-naphthol-3,6(and 3,7)-disulfonic acids is used as coupling component)

Aqueous solution + HCl conc. — orange brown;
+ NaOH conc. — corinth

Discoverers — O. Gürke and C. Rudolph (Badische Co.) 1885

Crocein AZ (C)

Dyes wool neutral or in the presence of acid, and cotton and jute in the presence of alum and Glauber's salt. Good fastness to light, moderate to milling and poor to stoving

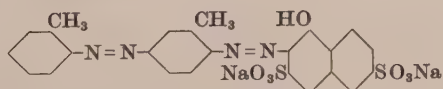
BP 15716/85; *FP* 173007; *GP* 38281, *GP ap.* G3636, (*Fr.* 1, 385-6)

FIAT 764 — Erythrin PX

Soluble in water (magenta red)

Slightly soluble in ethanol (red)

H₂SO₄ conc. — dark blue; on dilution — reddish brown

26765 Acid Dye

4-*o*-Tolylazo-*o*-toluidine → 1-Naphthol-3,6-disulfonic acid

Azo Cerise M (K)

Very soluble in water (magenta to wine red)

Soluble in ethanol (red)

H₂SO₄ conc. — deep blue; on dilution — brown

Aqueous solution + HCl conc. — orange brown;
+ NaOH conc. — corinth

26766 C.I. Solvent Red 32 (Bluish red)

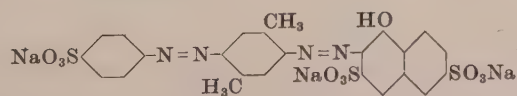
Convert C.I.26765 into the dicyclohexylamine salt

Discoverers — G. Kränzlein, C. Hartmann and A. Hardt 1926

I.G., *BP* 277371; *USP* 1800299-300, 1860036; *GP* 561338 (*Fr.* 18, 1849)

FIAT 764 — Zaponechtrot CB

FIAT 1313, 3, 132

26770 Acid Dye

Sulfanilic acid → 2,5-Xylidine → 1-Naphthol-3,6-disulfonic acid

Discoverer — Badische Co.

New Bordeaux PX (B)

Soluble in water (magenta red to rubine)

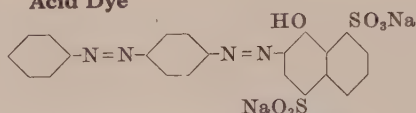
Very slightly soluble in ethanol

H₂SO₄ conc. — bluish green; on dilution — reddish violet

Aqueous solution + HCl conc. — reddish violet;
+ NaOH conc. — corinth

26780

Acid Dye



p-Phenylazoaniline → 1-Naphthol-4,8-disulfonic acid

Discoverer — C. Mensching 1884

Croceine Scarlet B (Sch)

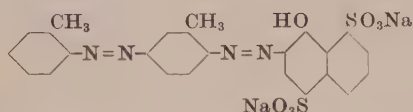
Dyes wool in the presence of acid

Schoellkopf, Hartford & Hanna Co., *BP* 15775/85; *USP* 333037;
FP 173083, 173084; *GP* 40571 (*Fr.* 1, 393)

Slightly soluble in water (magenta red)
 H_2SO_4 conc. — violet; on dilution — violet brown ppt.
 Aqueous solution + HCl — violet, then brown ppt;
 + NaOH — violet

26785

Acid Dye



4-*o*-Tolylazo-*o*-toluidine → 1-Naphthol-4,8-disulfonic acid

Discoverer — C. Mensching 1884

Croceine 3B (Sch)

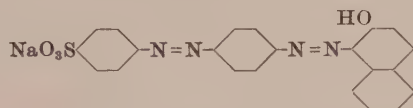
Dyes wool and silk in the presence of acid

Schoellkopf, Hartford & Hanna Co., *BP* 15775/85; *USP* 333034,
 333037; *GP* 40571 (*Fr.* 1, 393)

Soluble in water (magenta red)
 H_2SO_4 conc. — blue; on dilution — violet ppt, then magenta red
 solution
 Aqueous solution + HCl — violet ppt;
 + NaOH — violet

26900

C.I. Acid Red 151 (Red)



p-(*p*-Aminophenylazo)benzenesulfonic acid → 2-Naphthol

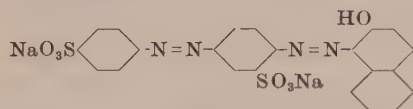
Discoverers — R. Nietzki 1878; R. Krügener 1879;
 F. Köhler 1880

Rumpff & Grässler, *BP* 5003/79
 Krügener, *BP* 5021/79; *GP* 16482 (*Fr.* 1, 443)
 M.L.B., *BP* 536/80
 Badische Co., *USP* 224928
 Obermiller, *Z. angew. Chem.* 38 (1925), 1044

Moderately soluble in water (cloudy, brownish orange)
 Soluble in ethanol (orange red) and Cellosolve
 Insoluble in other organic solvents
 H_2SO_4 conc. — bluish green; on dilution — weak brownish
 orange
 Aqueous solution + HCl conc. — orange brown;
 + NaOH conc. — corinth, ppt.

26905

C.I. Acid Red 66 (Yellowish red)



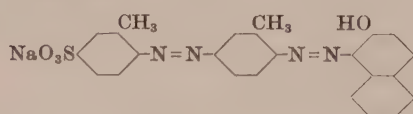
6-Amino-3,4'-azodibenzenesulfonic acid → 2-Naphthol

Discoverers — R. Nietzki 1879; R. Krügener 1879;
 C. Rumpff and F. Grässler 1879; F. Köhler 1880
 Krügener, *BP* 5021/79, 529/80, 536/80; *GP* 16482 (*Fr.* 1, 443)
 Rumpff & Grässler, *BP* 5003/79; *FP* 133864, 134802; *GP*
 16483 (*Fr.* 1, 446)
 Badische Co., *USP* 224927-8
FIAT 764 — Scharlach 3B
 Nietzki, *Ber.* 13 (1880), 800, 1838
 von Miller, *Ber.* 13 (1880), 542, 803, 980
 Obermiller, *Z. angew. Chem.* 38 (1925), 1044

Soluble in water (orange red)
 Slightly soluble in ethanol and Cellosolve
 Insoluble in most other organic solvents
 H_2SO_4 conc. — dark green; on dilution — orange red to brown,
 ppt.
 HNO_3 conc. — blue solution, turns amber
 Aqueous solution + HCl conc. — red;
 + NaOH conc. — dark violet

26910

Acid Dye



4-(4-Amino-*m*-tolylazo)-*m*-toluenesulfonic acid → 2-Naphthol

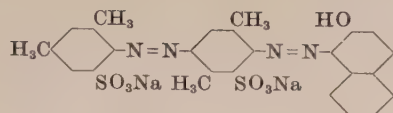
Discoverers — R. Nietzki 1878; R. Krügener 1878

Cloth Scarlet R (K)

Dyes chrome-mordanted wool and silk in the presence of acid

Rumpff & Grässler, *BP* 5003/79; *FP* 133864
 Krügener, *GP* 16482 (*Fr.* 1, 443)

Soluble in water (red)
 H_2SO_4 conc. — green; on dilution — blue solution, then red ppt.
 Aqueous solution + HCl — red ppt;
 + NaOH — yellowish brown ppt.

26915 Acid Dye

2-Amino-3,5-xylenesulfonic acid

→ 6-Amino-2,5-xylenesulfonic acid → 2-Naphthol

Note — In C.I. 1st Edition Bordeaux BX (By) was associated with both Nos. 287 and 263 (C.I.26915 and C.I.27025). It is not known which was correct

Discoverers — E. Frank 1879; R. Krügener**Bordeaux BX (By)**

Dyes wool in the presence of acid. Also used for dyeing jute

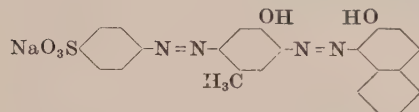
Rumpff & Grässler, *BP* 5003/79Krügener, *GP* 16482 (*Fr.* 1, 443)

Soluble in water and ethanol (red)

 H_2SO_4 conc. — dark green; on dilution — blue, then brownish red ppt.

Aqueous solution + HCl — dark reddish brown ppt;

+ NaOH — slightly browner

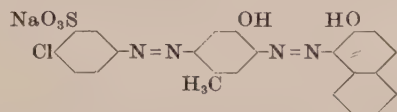
26920 C.I. Mordant Green 10 (Deep dull bluish green)Sulfanilic acid → 2-Amino-*p*-cresol → 2-Naphthol*Discoverer* — B. Richard 1907**Eriochrome Verdon A (Gy)**Geigy Co., *BP* 13903-4/09; *USP* 993549; *FP* 404535; *GP* 201377(*Fr.* 9, 351), *GP* 224024-5, 227197, (*Fr.* 10, 844, 845, 846)*Fierz-David*, 177

Soluble in water (violet) and ethanol (bluish red)

 H_2SO_4 conc. — green; on dilution — brownish red ppt.

Aqueous solution + HCl — bordeaux;

+ NaOH — bluish green

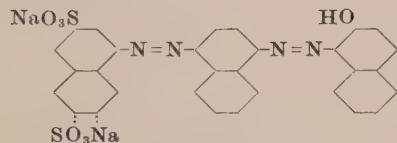
26925 C.I. Mordant Green 15 (Dull greenish blue)6-Chlorometanilic acid → 2-Amino-*p*-cresol → 2-Naphthol*Discoverer* — B. Richard 1907Geigy Co., *BP* 13903-4/09; *USP* 993549; *FP* 404535; *GP* 201377(*Fr.* 9, 351), *GP* 224024-5, 227197, (*Fr.* 10, 844, 845, 846)*FIAT* 764 — Saeurealizarinblaugruen L

Soluble in water (brown); moderately soluble in ethanol (reddish violet)

 H_2SO_4 conc. — green; on dilution — corinth

Aqueous solution + HCl conc. — orange brown;

+ NaOH conc. — greenish grey blue

26945 Acid Dye

4-Amino-2,6(and 2,7)-naphthalenedisulfonic acid

→ 1-Naphthylamine → 2-Naphthol

Discoverer — Badische Co.**Naphthol Black (B)***FIAT* 764 — Naphtolschwarz

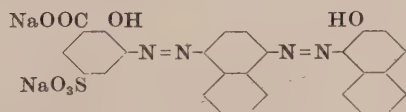
Soluble in water (reddish violet)

Slightly soluble in ethanol

 H_2SO_4 conc. — greyish blue; on dilution — reddish violet

Aqueous solution + HCl conc. — reddish violet;

+ NaOH conc. — reddish violet

26950 Mordant Dye

3-Amino-5-sulfosalicylic acid → 1-Naphthylamine → 2-Naphthol

Discoverers — K. Krekeler and R. Lauch 1893**Diamond Black NRM (By)**

An afterchrome dye

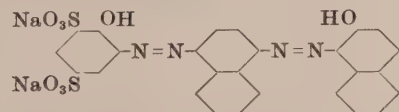
Bayer Co., *BP* 8299/89; *FP* 198521; *GP* 60440 (*Fr.* 3, 608)

Moderately soluble in water and ethanol (violet)

 H_2SO_4 conc. — dark bluish grey; on dilution — violet

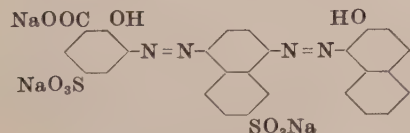
Aqueous solution + HCl conc. — rather dull reddish violet;

+ NaOH conc. — reddish blue

26955 C.I. Mordant Black 18 (Black)

6-Amino-1-phenol-2,4-disulfonic acid

→ 1-Naphthylamine → 2-Naphthol

Discoverer — B. Richard*Fierz-David*, 171**26960 Mordant Dye**

3-Amino-5-sulfosalicylic acid → 1,7-Cleve's acid → 2-Naphthol

Discoverer — Bayer Co.**Acid Chrome Black M (By)**

Soluble in water (deep violet)

Slightly soluble in ethanol (pale corinth)

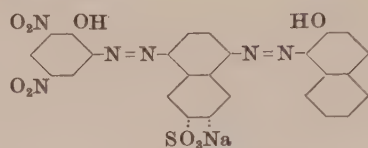
 H_2SO_4 conc. — dullish blue; on dilution — corinth

Aqueous solution + HCl conc. — weaker, corinth;

+ NaOH conc. — reddish blue

26965

Acid Dye

Picramic acid \rightarrow 1,6(and 1,7)-Cleve's acid \rightarrow 2-Naphthol

Discoverers — W. Herzberg and O. Hansmann 1896

Granite Black A (A)

Dyes wool in the presence of acid

Agfa, BP 21437/96; USP 583439; FP 260056; GP 113241 (Fr. 5, 526)

Soluble in water (dull violet blue)

Slightly soluble in ethanol (bluish violet)

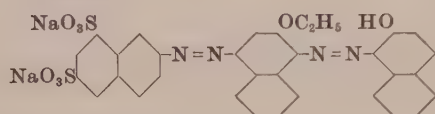
 H_2SO_4 conc. — blackish violet; on dilution — dark violet blue ppt.

Aqueous solution + HCl — dark violet blue ppt;

+ NaOH — dark greenish blue ppt.

26980

Direct Dye

7-Amino-1,3-naphthalenedisulfonic acid
 \rightarrow 2-Ethoxy-1-naphthylamine \rightarrow 2-Naphthol

Discoverer — A. Weinberg 1889

Diamine Blue 6G (C)

Fierz-David & Ischer, *Helv. Chim. Acta*, 21 (1938), 664

Soluble in water (dark blue)

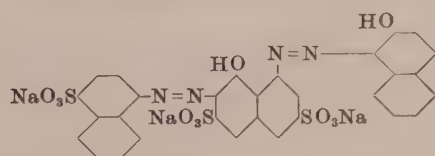
 H_2SO_4 conc. — bluish green; on dilution — violet ppt.

Aqueous solution + HCl — violet ppt;

+ NaOH conc. — duller blue

26990

C.I. Acid Black 32 (Greenish black)

Naphthionic acid \rightarrow (alk.) H acid \rightarrow 2-Naphthol

Discoverer — M. Böniger 1903

Sandoz, BP 14768/03; GP 158134 (Fr. 7, 784)

Soluble in water (black) and ethanol

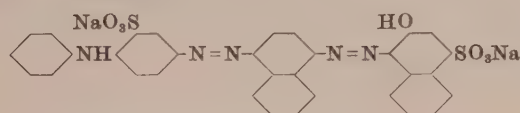
Slightly soluble in Cellosolve

 H_2SO_4 conc. — dull bluish violet; on dilution — olive solutionAqueous solution + H_2SO_4 10% — no change;

+ NaOH 10% — dull bluish red

26995

Acid Dye

5-Amino-2-anilinobenzenesulfonic acid
 \rightarrow 1-Naphthylamine \rightarrow 2-Naphthol-4-sulfonic acid

Discoverer — Agfa

Nerol GGL (A)

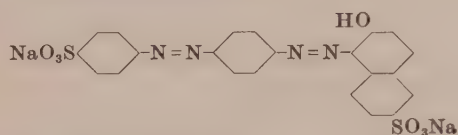
Dyes wool in the presence of acid

Fastness Properties (C): Light 4, Milling 3-4,
Perspiration 4, Washing 4

FIAT 764 — Nerol GGL

27000

C.I. Acid Red 142 (Red)

 p -(p -Aminophenylazo)benzenesulfonic acid \rightarrow Schaeffer's acid

Discoverers — R. Nietzki 1879; R. Krügener 1879;

F. Köhler 1880; C. Rumpff and F. Grässler 1879

Krügener, BP 5021/79, 529/80, 536/80; GP 16482 (Fr. 1, 443)

Rumpff & Grässler, BP 5003/79; FP 133864, 134802; GP 16483 (Fr. 1, 446)

Badische Co., USP 224927-8

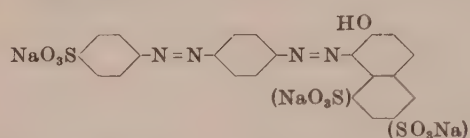
Soluble in water (red) and ethanol (orange red)

 H_2SO_4 conc. — deep blue; on dilution — red

Aqueous solution + HCl conc. — brownish orange to brownish red; + NaOH conc. — dark corinth

27001

Acid Dye

 p -(p -Aminophenylazo)benzenesulfonic acid
 \rightarrow [Schaeffer's acid (0.5 mol.)]
[Crocein acid (0.5 mol.)]

Discoverers — C. Rumpff, E. Frank 1881

New Red 5R (IG)

Bayer Co., BP 1225/81, 2030/81; USP 256380-1; FP 142024;
GP 18027 (Fr. 1, 364)

FIAT 764 — Neurot 5R

Soluble in water (red)

Slightly soluble in ethanol (orange red)

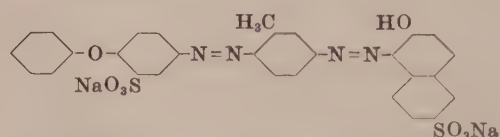
 H_2SO_4 conc. — deep blue; on dilution — red

Aqueous solution + HCl conc. — orange brown;

+ NaOH conc. — bordeaux

27010

Acid Dye

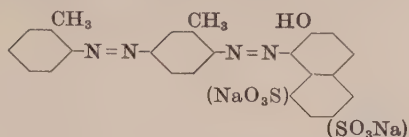
6-Phenoxytanilic acid \rightarrow m -Toluidine \rightarrow Schaeffer's acid

Discoverer — M. Cantor 1911

Cloth Red GL (By)

Agfa, BP 10835/11; USP 1042198; FP 430962; GP 252138 (Fr. 11, 387)

27015 C.I. Acid Red 177 (Red)



4-*o*-Tolylazo-*o*-toluidine → [Schaeffer's acid (0.5 mol.)]
Crocein acid (0.5 mol.)

Discoverer — R. Krügener 1879

Rumpff & Grässler, *BP* 5003/79; *FP* 133864, 134802

Krügener, *GP* 16482 (*Fr.* 1, 443)

Möhlau & Mätzler, *Ber.* 46 (1913), 456

Slightly soluble in water

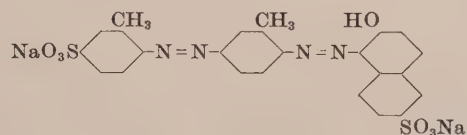
Moderately soluble in ethanol (red)

H₂SO₄ conc. — deep blue; on dilution — weak reddish orange

Aqueous solution + HCl conc. — orange red brown;

+ NaOH conc. — orange red brown

27020 Acid Dye



4-(4-Amino-*m*-tolylazo)-*m*-toluenesulfonic acid → Schaeffer's acid

Discoverers — C. Rumpff and F. Grässler 1879

Bordeaux G (By)

Dyes wool in the presence of acid

Rumpff & Grässler, *BP* 5003/79; *GP* 16483 (*Fr.* 1, 446)

Krügener, *GP* 16482 (*Fr.* 1, 443)

Soluble in water (bluish red to magenta)

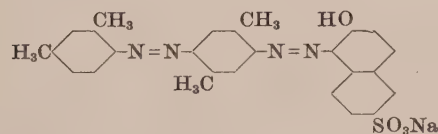
Slightly soluble in ethanol (red)

H₂SO₄ conc. — dark blue (+ blue and magenta) on dilution — wine red

Aqueous solution + HCl conc. — orange red brown;

+ NaOH conc. — bordeaux

27025 Acid Dye



2,4-Xylidine → 2,5-Xylidine → Schaeffer's acid

Discoverers — Rubel 1879; R. Krügener

Bordeaux BX (By)

Dyes wool in the presence of acid. Also used for dyeing jute

Krügener, *BP* 529/80; *GP* 16482 (*Fr.* 1, 443)

Rumpff & Grässler, *BP* 5003/79

C.I.263 (1st Ed.) (See note under C.I.26915)

Noelting & Forel, *Ber.* 18 (1885), 2682

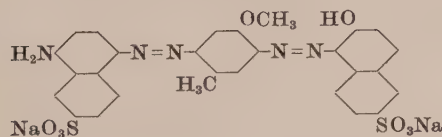
Soluble in water (brownish red) and ethanol (bordeaux red)

H₂SO₄ conc. — green; on dilution — brownish red ppt.

Aqueous solution + HCl — brownish red;

+ NaOH — brownish red ppt.

27050 C.I. Direct Blue 124 (Dull blue → Greenish blue)*



5-Amino-8-nitro-2-naphthalenesulfonic acid

→ Cresidine → Schaeffer's acid;

then reduce the nitro group to amino

*Developed with 2-naphthol

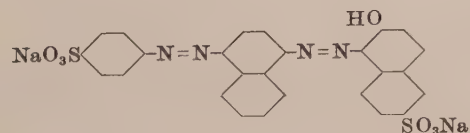
Soluble in water (dull violet)

H₂SO₄ conc. — violet to blue; on dilution — orange red

HCl conc. — dull violet solution, then bluish violet ppt.

NaOH — violet grey solution, then grey blue ppt.

27060 Acid Dye



Sulfanilic acid → 1-Naphthylamine → Schaeffer's acid

Discoverer — E. Frank (Bayer Co.) 1882

Fast Violet R (By)

Dyes wool in the presence of acid and also chrome-mordanted wool

Cassella Co., *GP* 40977 (*Fr.* 1, 451)

FIAT 764 — Patentschwarz I

Soluble in water (bordeaux)

Very slightly soluble in ethanol

H₂SO₄ conc. — dark greyish blue; on dilution — wine red

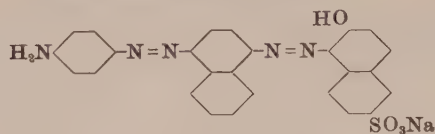
Aqueous solution + HCl conc. — wine red;

+ NaOH conc. — dullish violet

27065 C.I. Acid Black 20 (Violet black)

Discoverer — C. Mensching 1899

Levinstein Ltd., BP 24980/99; USP 654167, 654168; FP 295807; GP 122457 (Fr. 6, 871)



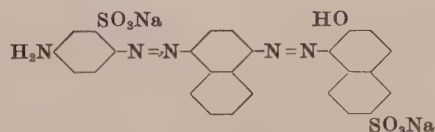
p-Aminoacetanilide → 1-Naphthylamine → Schaeffer's acid;
and finally hydrolyse the amide group

Soluble in water (violet)
H₂SO₄ conc. — green; on dilution — wine red
Aqueous solution + HCl — ppt;
+ NaOH — unaltered

27066 Direct Dye

Discoverer — Herwig

Diazo Indigo Blue R (By)

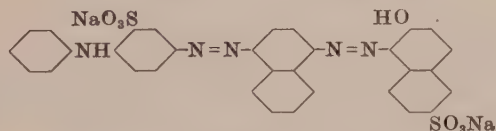


5-Acetamido-2-aminobenzenesulfonic acid
→ 1-Naphthylamine → Schaeffer's acid;
and finally hydrolyse the amide group

Very soluble in water (violet black)
Soluble in ethanol (navy blue)
H₂SO₄ conc. — violet grey; on dilution — reddish violet
Aqueous solution + HCl conc. — bordeaux ppt;
+ NaOH conc. — violet ppt.

27070 C.I. Acid Black 26 (Navy → Bluish black)

Discoverer — Agfa 1897

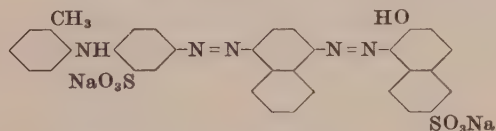
BP 24527/97; FP 271609; GP 101274 (Fr. 5, 514)
FIAT 764 — Nerol VL, Nerol TTL

5-Amino-2-anilinobenzenesulfonic acid
→ 1-Naphthylamine → Schaeffer's acid

Soluble in water
Slightly soluble in ethanol
Very slightly soluble in acetone
H₂SO₄ conc. — violet; on dilution — blue

27075 C.I. Acid Black 26:1 (Navy → Bluish black)

Discoverer — Agfa 1897

BP 24527/97; FP 271609; GP 101274 (Fr. 5, 514)
FIAT 764 — Nerol B, BB, 4B

5-Amino-2-*o*-toluidinobenzenesulfonic acid
→ 1-Naphthylamine → Schaeffer's acid

Note — Nerol B (A) had 5-amino-2-*p*-toluidinobenzenesulfonic acid as first component

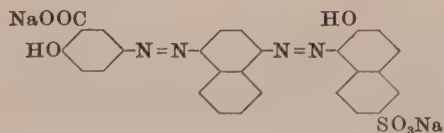
Soluble in water (reddish violet)
Insoluble in ethanol and acetone
H₂SO₄ conc. — blackish violet; on dilution — dark blue, black ppt.
Aqueous solution + NaOH 10% — pale dull violet

27080 Mordant Dye

Discoverers — R. Lauch and C. Krekeler 1889

Diamond Black L (By)

Bayer Co., BP 8299/89; USP 438438; FP 198521; GP 51504 (Fr. 2, 325)



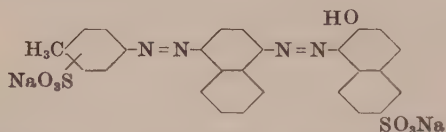
5-Aminosalicylic acid → 1-Naphthylamine → Schaeffer's acid

27085 Acid Dye

Discoverers — Bayer Co. 1882; Cassella Co. 1886

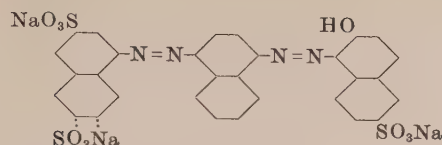
Fast Violet B (By)

Dyes wool from acid bath violet. Moderate fastness light and milling, good fastness alkalis and acids
Cassella Co., GP 40977 (Fr. 1, 451)



Sulfo-*p*-toluidine → 1-Naphthylamine → Schaeffer's acid

Soluble in water and ethanol (violet)
H₂SO₄ conc. — dull green; on dilution — violet ppt.
Aqueous solution + HCl — violet ppt;
+ NaOH — violet ppt. (from conc. solution)

27090 Acid Dye

4-Amino-2,6(and 2,7)-naphthalenedisulfonic acid
→ 1-Naphthylamine → Schaeffer's acid

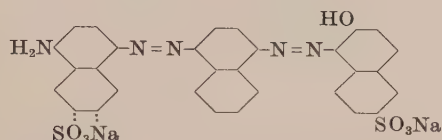
Discoverers — M. Hoffmann and A. Weinberg 1885

Violet Black S (C)

Cassella Co., *BP* 9214/85; *USP* 345901; *FP* 170342; *GP* 39029

(*Fr.* 1, 450)

FIAT 764 — Violettsschwarz S

27095 C.I. Direct Blue 129 (Dull blue)*

5(and 8)-Acetamido-8(and 5)-amino-2-naphthalenesulfonic acid
→ 1-Naphthylamine → Schaeffer's acid;
and hydrolyse the amide group

* Developed with 2-naphthol

Discoverer — Cassella Co.

JSDC, 12 (1896), 66, 122

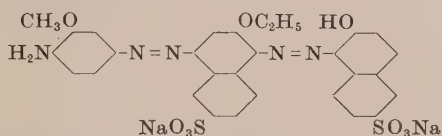
Soluble in water (dull reddish blue)

Insoluble in ethanol

H₂SO₄ conc. — navy blue; on dilution — reddish violet

Aqueous solution + H₂SO₄ 10% — slightly duller;

+ NaOH conc. — slightly greener

27110 C.I. Direct Blue 130 (Blue)*

4'-Amino-*o*-acetanisidide
→ 5-Amino-6-ethoxy-2-naphthalenesulfonic acid
→ Schaeffer's acid;

and finally hydrolyse the amide group

* Developed with 2-naphthol

Discoverers — W. Neelmeier and J. Heusner 1922

I.G., *USP* 1504134; *FP* 565975; *GP* 440571 (*Fr.* 15, 530)

FIAT 764 — Diazobrantblau BBL

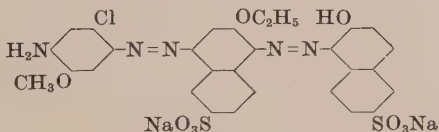
Very soluble in water (dark navy blue)

Soluble in ethanol (greenish blue)

H₂SO₄ conc. — dark blue; on dilution — violet

Aqueous solution + HCl conc. — violet black, ppt;

+ NaOH conc. — dark blue, ppt.

27115 C.I. Direct Blue 122 (Blue)*

4'-Amino-5'-chloro-2'-methoxyoxanilic acid
→ 5-Amino-6-ethoxy-2-naphthalenesulfonic acid
→ Schaeffer's acid;

and finally hydrolyse the oxamic acid group

* Developed with 2-naphthol

Discoverer — O. Goos 1934

I.G., *USP* 1504134; *FP* 565975; *GP* 440571 (*Fr.* 15, 530)

FIAT 764 — Diazobrantblau BBLA

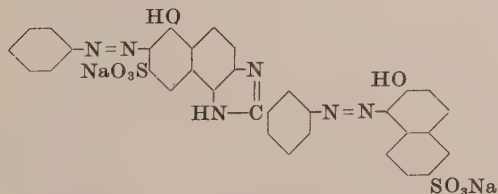
The following reactions are those of Diazo Brilliant Blue BBLA (IG)
which was a mixture of C.I.27115 and C.I.27110

Soluble in water (dark navy blue) and ethanol (blue)

H₂SO₄ conc. — dark blue; on dilution — reddish violet

Aqueous solution + HCl conc. — reddish violet, ppt;

+ NaOH conc. — violet, ppt.

27130 C.I. Direct Red 6 (Bright yellowish red)

Aniline
→ 2-(*m*-Aminophenyl)-6-hydroxy-1*H*-naphth-
[1,2]imidazole-8-sulfonic acid → Schaeffer's acid

Discoverers — G. Kalischer, F. Klingemann and R. Schüle 1905;
A. Schedler 1906

Cassella Co., *USP* 807119, 813155, 873798, 886985

Ciba, *BP* 12421/06; *USP* 837736; *GP* ap. G23113-4 (*Fr.* 9, 400,
401)

FIAT 764 — Diaminechtscharlach GG

Joyce, *Ind. Eng. Chem.* 13 (1921), 947

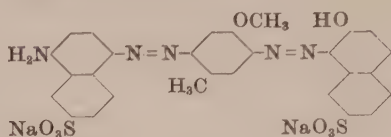
Soluble in water (orange red to scarlet)

Very slightly soluble in ethanol (pale brownish orange)

H₂SO₄ conc. — magenta red; on dilution — orange

Aqueous solution + HCl conc. — orange red, ppt;

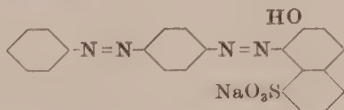
+ NaOH conc. — orange brown

27140 C.I. Direct Blue 128 (Blue)*

5-Amino-8-nitro-2-naphthalenesulfonic acid
 → Cresidine → 2-Naphthol-7-sulfonic acid;
 and finally reduce the nitro group to amino

* Developed with 2-naphthol

Soluble in water (dull violet)
 H₂SO₄ conc. — violet to blue; on dilution — orange red

27150 Acid Dye

p-Phenylazoaniline → Crocein acid

Discoverers — C. Rumpff and F. Grässler 1879

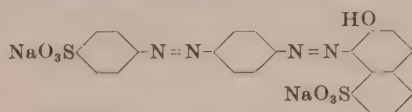
Metanil Red 3B (By)

Rumpff & Grässler, *BP* 5003/79; *FP* 133864

Krügener, *GP* 16482 (*Fr.* 1, 443)

FIAT 764 — Metanilrot 3B

Slightly soluble in water and ethanol (orange)
 H₂SO₄ conc. — violet; on dilution — brown
 Aqueous solution + HCl conc. — weak corinth, ppt;
 + NaOH conc. — corinth

27155 C.I. Acid Red 70 (Bright yellowish red)

p-(*p*-Aminophenylazo)benzenesulfonic acid → Crocein acid

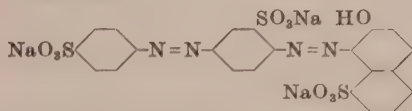
Discoverer — C. Rumpff 1881

Bayer Co., *BP* 1225/81, 2030/81; *USP* 256380-1; *FP* 142024;

GP 18027 (*Fr.* 1, 364)

FIAT 764 — Croceinscharlach 3B

Soluble in water and ethanol (reddish orange)
 H₂SO₄ conc. — blue; on dilution — pink
 Aqueous solution + HCl conc. — brownish orange;
 + NaOH conc. — dark violet

27160 Acid Dye

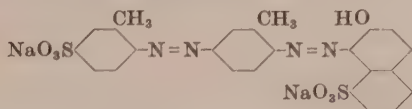
6-Amino-3,4'-azodibenzenesulfonic acid → Crocein acid

Discoverer — Reinhardt 1888

Croceine Scarlet O extra (K)

Dyes wool and silk in the presence of acid

Soluble in water (yellowish red)
 H₂SO₄ conc. — blue; on dilution — yellowish red
 Aqueous solution + HCl — violet;
 + NaOH — violet

27165 C.I. Acid Red 71 (Red)

4-(4-Amino-*m*-tolylazo)-*m*-toluenesulfonic acid → Crocein acid

Croceine Scarlet 7B (By)

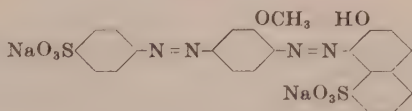
Discoverers — C. Rumpff, E. Frank 1881

Bayer Co., *BP* 1225/81; *USP* 256375; *FP* 142024; *GP* 18027

(*Fr.* 1, 364)

FIAT 764 — Croceinscharlach 7B

Soluble in water (magenta red) and ethanol (reddish orange)
 H₂SO₄ conc. — blue; on dilution — pink
 Aqueous solution + HCl conc. — magenta red;
 + NaOH conc. — much paler, weak corinth

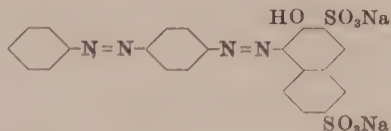
27180 C.I. Acid Red 56 (Bluish red)

Sulfanilic acid → *o*-Anisidinomethanesulfonic acid
 — hydrolyse the methanesulfonic acid group
 → Crocein acid

Discoverer — Agfa 1893

FIAT 764 — Croceinscharlach 10B

Soluble in water (magenta red) and ethanol (reddish orange)
 H₂SO₄ conc. — greenish blue; on dilution — pink
 Aqueous solution + HCl conc. — reddish violet;
 + NaOH conc. — violet

27190 C.I. Acid Red 150 (Bright red)

p-Phenylazoaniline → R acid

Discoverers — R. Krügener 1879

C. Rumpff and F. Grässler 1879

Rumpff & Grässler, *BP* 5003/79; *FP* 133864, 134802

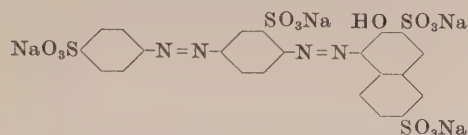
Krügener, *BP* 529/80; *GP* 16482 (*Fr.* 1, 443)

M.L.B., *BP* 536/80; *USP* 233465

FIAT 764 — Tuchtrot G, Wollrot B

These are mixed dyes in which C.I.27190 is only one component
 Knecht, *JSDC*, 19 (1903), 171; *Ber.* 36 (1903), 1553

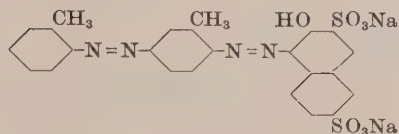
Soluble in water (red) and in Cellosolve
 Insoluble in ethanol and other organic solvents
 H₂SO₄ conc. — purple; on dilution — purple ppt.
 HNO₃ conc. — blue solution, turns amber with black ppt.
 Aqueous solution + NaOH 10% — purplish

27195 C.I. Acid Red 112 (similar) (Bright bluish red)

6-Amino-3,4'-azodibenzenesulfonic acid → R acid

Discoverer — Pfaff 1880
 von Miller, *Ber.* **13** (1880), 542
Chem. Ind. **3** (1880), 173, 203, 388

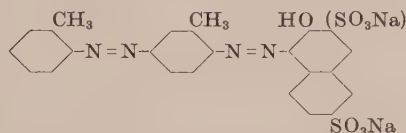
Soluble in water (magenta red)
 H_2SO_4 conc. — blue; on dilution — orange red
 Aqueous solution + HCl — scarcely altered;
 + NaOH — violet ppt. in concentrated solution

27200 C.I. Acid Red 115 (Bluish red)4-*o*-Tolylazo-*o*-toluidine → R acid

See also C.I.27201

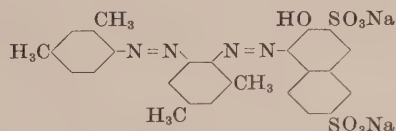
Discoverers — R. Krügener 1879
 C. Rumpff and F. Grässler 1879
 Rumpff & Grässler, *BP* 5003/79; *FP* 133864, 134802; *GP* 16483
 (*Fr.* **1**, 446)
 Krügener, *GP* 16482 (*Fr.* **1**, 443)
 M.L.B., *BP* 536/80
FIAT 764 — Wollrot B
 This is a mixed dye in which C.I.27200 is only one component.
 See C.I.27190

Soluble in water (magenta red)
 Slightly soluble in ethanol
 H_2SO_4 conc. — deep blue; on dilution — pink
 Aqueous solution + HCl conc. — dullish violet;
 + NaOH conc. — bordeaux

27201 C.I. Acid Red 115 (similar) (Bluish red)4-*o*-Tolylazo-*o*-toluidine → Mixture of Schaeffer's acid and R acid

Discoverer — R. Krügener 1879
 Krügener, *GP* 16482 (*Fr.* **1**, 443)
 Rumpff & Grässler, *BP* 5003/79; *FP* 133864, 134802
 M.L.B., *BP* 536/80
FIAT 764 — Tuchrot O

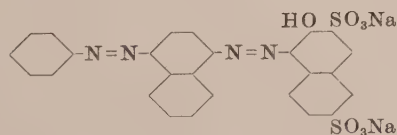
Soluble in water (magenta red)
 Very slightly soluble in ethanol, acetone and Cellosolve
 Insoluble in other organic solvents
 H_2SO_4 conc. — deep blue; on dilution — red violet, brown ppt.
 HNO_3 conc. — blue, changing to green then orange
 Aqueous solution + HCl conc. — wine red;
 + NaOH conc. — bordeaux

27210 C.I. Acid Red 170 (Red)

6-(2,4-Xylylazo)-2,4-xylylidine → R acid

Discoverers — L. Limpach 1879; J. Schunke
 M.L.B., *BP* 5003/79, 5021/79, 536/80; *USP* 210233; *GP* 22010
 (*Fr.* **1**, 445)
 Badische Co., *USP* 246221
 Nölting & Forel, *Ber.* **18** (1885), 2682

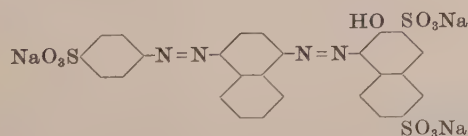
Soluble in water (bluish red)
 H_2SO_4 conc. — dark blue; on dilution — reddish brown, ppt.
 Aqueous solution + HCl — brownish red ppt;
 + NaOH — soluble brown, ppt.

27220 Acid Dye

Aniline → 1-Naphthylamine → R acid

Discoverer — Cassella Co.
Naphthylamine Black RF (C)
FIAT 764 — Naphtylaminschwarz RF

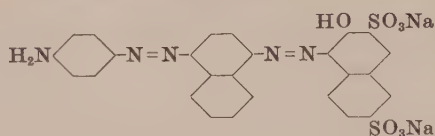
Slightly soluble in water
 Insoluble in ethanol
 H_2SO_4 conc. — dark green; on dilution — corinth
 Aqueous solution + HCl conc. — corinth, ppt;
 + NaOH conc. — weak violet

27225 Acid Dye

Sulfanilic acid → 1-Naphthylamine → R acid

Patent Black II (IG)
 Cassella Co., *GP* 40977 (*Fr.* **1**, 451)
FIAT 764 — Patentschwarz II

Soluble in water (violet); insoluble in ethanol
 H_2SO_4 conc. — greenish grey black; on dilution — wine red
 Aqueous solution + HCl conc. — bordeaux;
 + NaOH conc. — dark blue to bluish black

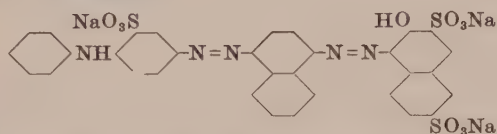
27230 C.I. Acid Black 23 (Black)

p-Aminoacetanilide → 1-Naphthylamine → R acid;
and finally hydrolyse the amide group

Discoverer — C. Mensching 1899

Levinstein Ltd., BP 24980/99; USP 654167-8; FP 295807;
GP 122457 (Fr. 6, 871)

Soluble in water (bluish black)
H₂SO₄ conc. — green; on dilution — red
Aqueous solution + HCl — redder;
+ NaOH — unaltered

27235 Acid Dye

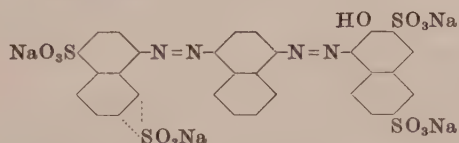
5-Amino-2-anilinobenzenesulfonic acid → 1-Naphthylamine → R acid

Discoverer — Agfa 1897

Agfa, BP 24527/97; FP 271609; GP 101274 (Fr. 5, 514)

C.I.305 (1st Ed.) — The constitution was wrongly attributed to
Nerol B (A) which had the constitution of C.I.27075

Battegay, *Rev. gén. Mat. Col.* 24 (1920), 4

27240 Acid Dye

4-Amino-1,5(and 1,6)-naphthalenedisulfonic acid
→ 1-Naphthylamine → R acid

Discoverers — M. Hoffmann and A. Weinberg 1885

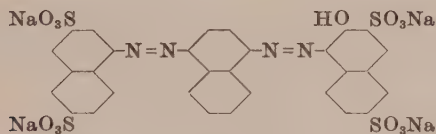
Naphthol Black 6B (C)

Dyes wool in the presence of acid

Cassella Co., BP 9214/85; USP 345901; FP 170342; GP 39029
(Fr. 1, 450)

Knecht, *JSDC*, 2 (1886), 112

Soluble in water (violet)
H₂SO₄ conc. — greenish black; on dilution — greenish blue, then
violet ppt.
Aqueous solution + HCl — unaltered;
+ NaOH — blackish blue

27245 Acid Dye (Black)

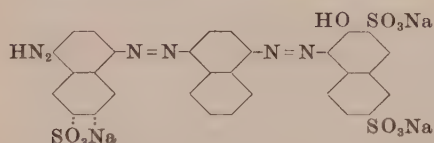
4-Amino-2,7-naphthalenedisulfonic acid
→ 1-Naphthylamine → R acid

Discoverers — M. Hoffmann and A. Weinberg 1885

Brilliant Black B (B)

Dyes wool in the presence of acid in level, bluish black
shades; good light fastness; poor fastness to milling and
washing

Cassella Co., BP 9214/85; USP 345901; FP 170342; GP 39029
(Fr. 1, 450)

27250 Direct Dye

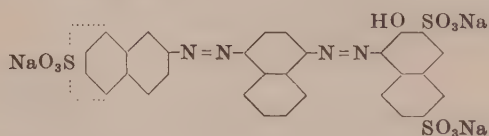
5(and 8)-Acetamido-8(and 5)-amino-2-naphthalenesulfonic acid
→ 1-Naphthylamine → R acid;
and finally hydrolyse the amide group

Benzo Viscose Grey 5B (IG)

Diaminogen Blue G (IG)

FIAT 764 — Benzoviskosegrau 5B

FIAT 1313, 2, 266 — Diaminogen Blue G

27255 Acid Dye

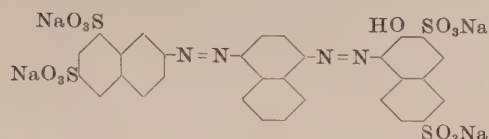
6(and 7)-Amino-1-naphthalenesulfonic acid
→ 1-Naphthylamine → R acid

Discoverers — Glaser 1882; L. Limpach 1882

Blue Black B (B)

Dyes wool in presence of acid

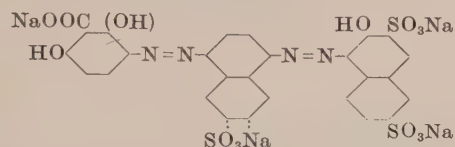
Soluble in water (bluish violet)
H₂SO₄ conc. — bluish green; on dilution — blue, then blue ppt.
Aqueous solution + HCl — blue ppt;
+ NaOH — blue ppt.

27260 C.I. Acid Black 3 (Bluish black)

7-Amino-1,3-naphthalenedisulfonic acid
→ 1-Naphthylamine → R acid

Discoverers — M. Hoffmann and A. Weinberg 1885
Cassella Co., *BP* 9214/85; *USP* 345901; *FP* 170342; *GP* 39029
(*Fr.* 1, 450)
FIAT 764 — Carbonschwarz G

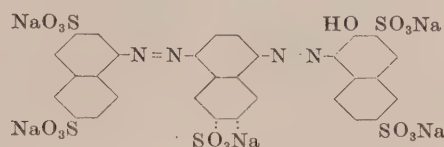
Soluble in water (violet)
Slightly soluble in ethanol
 H_2SO_4 conc. — grey; on dilution — violet
Aqueous solution + HCl conc. — blue;
+ NaOH conc. — blue

27270 C.I. Mordant Black 50 (Black)

3(and 5)-Aminosalicylic acid → 1,6(and 1,7)-Cleve's acid → R acid

Discoverer — M. Hoffmann (Cassella Co.) 1891
Saeurechromschwarz STM
Anthracensaeureschwarz SAS

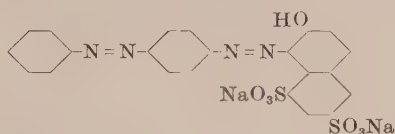
Soluble in water (violet)
Very slightly soluble in ethanol (pale yellow)
 H_2SO_4 conc. — bluish green; on dilution — bordeaux;
Aqueous solution + HCl conc. — bordeaux;
+ NaOH conc. — dark navy blue

27275 C.I. Acid Black 36 (Dull greyish black)

4-Amino-2,7-naphthalenedisulfonic acid
→ 1,6(and 1,7)-Cleve's acid → R acid

Discoverers — K. Elbel, F. Krecke and J. Rosenberg 1891-96
Kalle Co., *BP* 2718/92; *USP* 476070, 546068, 546069; *FP* 219224;
GP 73901 (*Fr.* 3, 552), 83572, 84460, (*Fr.* 4, 735, 737)

Soluble in water (dark reddish violet)
 H_2SO_4 conc. — dark greenish blue; on dilution — dark violet
Aqueous solution + HCl — blue;
+ NaOH — pure blue

27290 C.I. Acid Red 73 (Yellowish red)

p-Phenylazoaniline → G acid

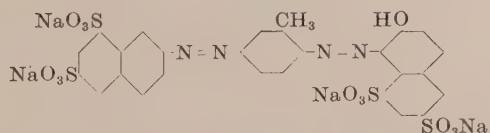
Discoverers — L. Limpach 1882
L. Gans and M. Hoffmann 1883
Cassella Co., *BP* 816/84; *USP* 314939; *FP* 159998
M.L.B., *GP* 36491 (*Fr.* 1, 381)
FIAT 764 — Brillantcrocein MOO, Baumwollscharlach ex.
Seyewetz & Chaix, *Bull. Soc. chim.*, **41** (1927), 332

Soluble in water (red), ethanol and Cellosolve
Very slightly soluble in acetone
Insoluble in other organic solvents
 H_2SO_4 conc. — reddish violet; on dilution — reddish brown ppt.
 HNO_3 conc. — blue, becoming olive brown, then orange
Aqueous solution + HCl conc. — dark reddish brown, ppt;
+ NaOH conc. — dark brown, ppt.

27291 C.I. Solvent Red 30 (Yellowish red)

Convert C.I.27290 into the dicyclohexylamine salt

Discoverers — G. Kränzlein, C. Hartmann and A. Hardt 1926
Patents as for C.I.27306
FIAT 764 — Zaponechtschlarlach CG
FIAT 1313, 3, 132

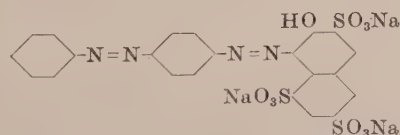
27300 C.I. Acid Red 47 (Bright bluish red)

7-Amino-1,3-naphthalenedisulfonic acid
→ *o*-Toluidinomethanesulfonic acid;
hydrolyse the methanesulfonic acid group → G acid

In *C.I.313* (1st Ed.) the end component is given as a mixture of R and G acids

Discoverer — A. Weinberg (Cassella Co.) 1886
FIAT 764 — Brillantcrocein 9B
Zapon Fast Scarlet PAJ (IG) was the corresponding di-*o*-
tolylguanidine salt (*FIAT* 1313, 3, 133)

Soluble in water (magenta red)
Insoluble in ethanol
 H_2SO_4 conc. — deep blue; on dilution — magenta red
Aqueous solution + HCl conc. — magenta to wine red;
+ NaOH conc. — dark brown

27305 Acid Dye

p-Phenylazoaniline → 2-Naphthol-3,6,8-trisulfonic acid

Discoverer — L. Limpach 1881

Ponceau 5R (MLB)

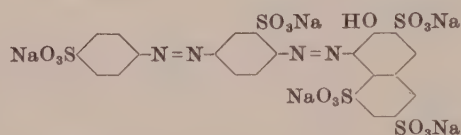
Dyes wool and silk in the presence of acid
M.L.B., *BP* 2544/82; *USP* 268507; *FP* 149249; *GP* 22038
(*Fr.* 1, 387)
FIAT 764 — Ponceau 5R
FDX 885 — Erythrin X

Soluble in water (red)
Slightly soluble in ethanol (magenta red)
 H_2SO_4 conc. — violet (+ dark blue); on dilution — pink
Aqueous solution + HCl conc. — red;
+ NaOH conc. — brown

27306 C.I. Solvent Red 31 (Red)

Convert C.I.27305 into the dicyclohexylamine salt

Discoverers — G. Kränzlein, C. Hartmann and A. Hardt 1926
 I.G., *BP* 277371; *USP* 1800299-300, 1860036; *GP* 561338
 (Fr. 18, 1849)
FIAT 764 — Zaponechtscharlach CR
FIAT 1313, 3, 133

27310 Acid Dye

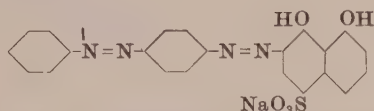
6-Amino-3,4'-azodibenzenesulfonic acid
 → 2-Naphthol-3,6,8-trisulfonic acid

Helio Purpurin 7BL (IG)

Note — The constitution given in *C.I.200 (1st Ed.)* appears to have been in error. See C.I.16190

27311 Solvent Dye

Convert C.I.27310 into the dicyclohexylamine salt

Zapon Fast Scarlet CRR (IG)*FIAT* 1313, 3, 133**27500 Acid Dye**

p-Phenylazoaniline → 4,5-Dihydroxy-1-naphthalenesulfonic acid

Note — In related brands *p*-phenylazoaniline may be replaced by its homologues

Discoverers — M. Ulrich and C. Duisberg 1890**Azo Acid Violet AL, (By)**

Dyes wool in the presence of acid

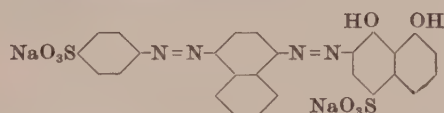
Bayer Co., *BP* 18517/89, 5984/91; *FP* 212468; *GP* 64017 (Fr. 3, 569)

For coupling of 4,5-dihydroxy-1-naphthalenesulfonic acid see C.I.16530

Soluble in water (red)

H₂SO₄ conc. — (AL) reddish blue, (4R) violet red; on dilution — red

Aqueous solution + HCl — (AL) unaltered, (4R) bluer;
 + NaOH — (AL) unaltered, (4R) soluble orange red ppt.

27510 C.I. Acid Black 5 (Black)

Sulfanilic acid → 1-Naphthylamine
 → 4,5-Dihydroxy-1-naphthalenesulfonic acid

Discoverers — M. Ulrich and C. Duisberg 1889Bayer Co., *BP* 13665/89; *FP* 200520; *GP* 61707 (Fr. 3, 575)

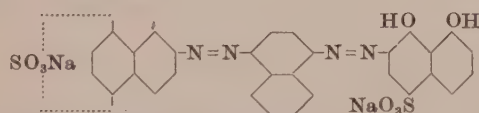
FIAT 764 — Viktoriaschwarz B
JSDC, 8 (1892), 74

Soluble in water (dark violet)

Slightly soluble in ethanol (violet blue)

H₂SO₄ conc. — green; on dilution — bordeaux

Aqueous solution + HCl conc. — bordeaux;
 + NaOH conc. — dark blue

27515 Acid Dye

6(and 7)-Amino-1-naphthalenesulfonic acid
 → 1-Naphthylamine → 4,5-Dihydroxy-1-naphthalenesulfonic acid

Discoverers — M. Ulrich and C. Duisberg 1889**New Victoria Black Blue (By)**

Bayer Co., *BP* 13665/89; *USP* 466202, 476336; *GP* 61707
 (Fr. 3, 575)

Moderately soluble in water (bluish black)

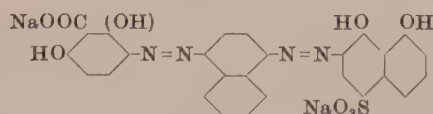
Slightly soluble in ethanol (reddish blue)

H₂SO₄ conc. — olive green; on dilution — dull violet to corinth

Aqueous solution + HCl conc. — bluish black;
 + NaOH conc. — violet black

27520 C.I. Acid Green 34 (Dull bluish green)

C.I. Mordant Green 12 (Greenish grey
 → Dull bluish green)



3(and 5)-Aminosalicylic acid → 1-Naphthylamine
 → 4,5-Dihydroxy-1-naphthalenesulfonic acid

Discoverers — K. Krekeler and R. Lauch 1890

Bayer Co., *BP* 13665/89, 1828/90; *USP* 438438, 464775; *FP*
 198521, 200520; *GP* 62133 (Fr. 3, 610)

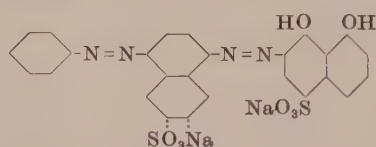
FIAT 764 — Diamantgruen BWBrenner, *Helv. Chim. Acta*, 3 (1920), 98

Soluble in water (dark blue)

Moderately soluble in ethanol (blue)

H₂SO₄ conc. — bluish green; on dilution — violet

Aqueous solution + HCl conc. — violet black;
 + NaOH conc. — dark blue

27530 Acid Dye

Aniline → 1,6(and 1,7)-Cleve's acid
 → 4,5-Dihydroxy-1-naphthalenesulfonic acid

Discoverer — Bayer Co. 1895Bayer Co., *BP* 5112/92; *GP* 92799 (Fr. 4, 755)

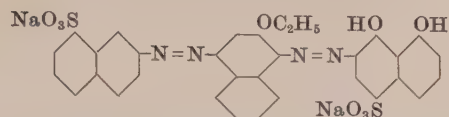
C.I.271 (1st Ed.) — association with Sulphon Black R (By)
 unconfirmed. Compare C.I. Acid Black 35

Erdmann, *Chem. Ind.* 19 (1896), 548

Soluble in water (reddish violet)

H₂SO₄ conc. — greenish blue; on dilution — dark green solution,
 then blue ppt. and solution

Aqueous solution + HCl — dark blue ppt;
 + NaOH — brownish red ppt.

27540 C.I. Direct Green 11 (Bluish green)

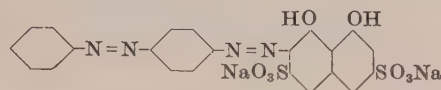
7-Amino-1-naphthalenesulfonic acid
 → 2-Ethoxy-1-naphthylamine
 → 4,5-Dihydroxy-1-naphthalenesulfonic acid

Bayer Co., BP 3397/90, 5984/91; FP 200785; GP 75551 (Fr. 3, 585)

BIOS 1548, 183

FIAT 764 — Brillantbenzogrueen B

Soluble in water (bluish green) and Cellosolve
 Moderately soluble in ethanol
 Insoluble in other organic solvents
 H₂SO₄ conc. — brownish black; on dilution — pale bluish green
 HNO₃ conc. — olive, turns yellowish brown
 Aqueous solution + HCl conc. — bluish green, ppt;
 + NaOH conc. — greyish blue, ppt.

27560 Mordant Dye

p-Phenylazoaniline → Chromotropic acid

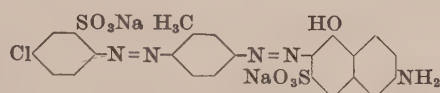
Discoverer — H. Koch 1890

Chromotrope 7B (MLB)

M.L.B., BP 9258/90; USP 458283; FP 212607; GP 69095 (Fr. 3, 588)

FIAT 764 — Chromotrope 7B

Soluble in water (magenta red) and ethanol (reddish violet)
 H₂SO₄ conc. — green; on dilution — pink
 Aqueous solution + HCl conc. — reddish brown;
 + NaOH conc. — dark blue

27600 Direct Dye

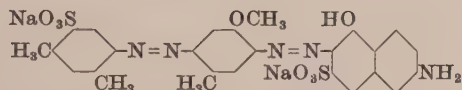
2-Amino-5-chlorobenzenesulfonic acid → *m*-Toluidine → (alk.) J acid

Discoverers — O. Günther, L. Hesse and A. Zart 1908

Brilliant Geranine 2BN (By)

Bayer Co., BP 4767/09; USP 933446, 933447, 933448, 933562
 FP 402120; GP 237742 (Fr. 10, 901)

Soluble in water (magenta red)
 Moderately soluble in ethanol (red)
 H₂SO₄ conc. — blue; on dilution — pink
 Aqueous solution + HCl conc. — wine red, ppt;
 + NaOH conc. — corinth

27625 Direct Dye

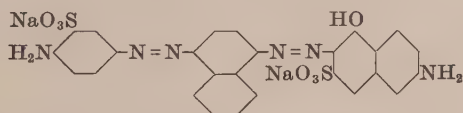
5-Amino-2,4-xylenesulfonic acid → Cresidine → (alk.) J acid

Discoverer — Bayer Co.

Benzo Violet M (By)

FIAT 764 — Benzoviolett M

Very soluble in water (reddish violet)
 Soluble in ethanol
 H₂SO₄ conc. — bluish green; on dilution — magenta red to reddish violet
 Aqueous solution + HCl conc. — reddish violet, ppt;
 + NaOH conc. — bordeaux, ppt.

27640 C.I. Direct Blue 140 (Reddish blue)*

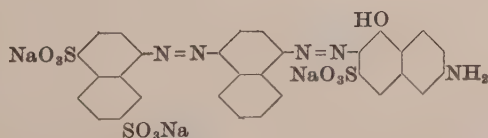
4'-Amino-2'-sulfooxanilic acid → 1-Naphthylamine → (alk.) J acid;
 and hydrolyse the oxamic acid group

* Developed with 2-naphthol

Discoverer — A. Blank (Bayer Co.)

FIAT 764 — Diazoindigoblau 3R

Very soluble in water (dark bordeaux)
 Soluble in ethanol (violet)
 H₂SO₄ conc. — bluish green; on dilution — violet
 Aqueous solution + HCl conc. — violet ppt;
 + NaOH conc. — corinth, ppt.

27645 Direct Dye

4-Amino-1,6-naphthalenedisulfonic acid → 1-Naphthylamine
 → (alk.) J acid

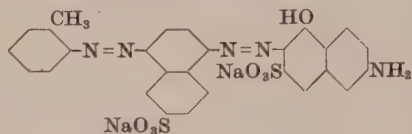
Discoverer — A. Blank (Bayer Co.) 1903

Benzo Fast Blue 5R (By)

Soluble in water (deep violet)
 Moderately soluble in ethanol (reddish violet)
 H₂SO₄ conc. — bluish green; on dilution — violet
 Aqueous solution + HCl conc. — deep violet, ppt;
 + NaOH conc. — brown, ppt.

27660 C.I. Direct Violet 5 (Dull violet)

Leonhardt, *GP* 114248 (*Fr.* 5, 952)
FIAT 764 — Benzviolett RL ex.

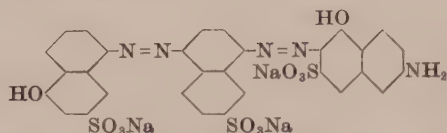


o-Toluidine → 1,6-Cleve's acid → (alk.) J acid

Soluble in water and ethanol (reddish violet)
 H_2SO_4 conc. — turquoise blue; on dilution — reddish violet
 Aqueous solution + HCl conc. — violet ppt;
 + NaOH conc. — dark blue

27665 Mordant Dye

Discoverer — W. Kirst 1937



M acid (5-Amino-1-naphthol-3-sulfonic acid) → 1,7-Cleve's acid
 → (alk.) J acid

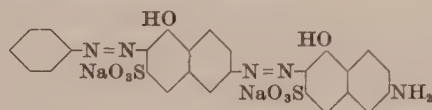
I.G., *BP* 497935; *USP* 2248091; *GP* 710395 (*Fr.-Bayer*, I-1, 1109)
BIOS Misc. 20
FIAT 764 — Autazolchrommarineblau f. BRA

Autazol Chrome Navy Blue BRA (IG)

Applied to wool and viscose and then chromed to give satisfactory wet fastness

27680 C.I. Direct Red 16 (Bordeaux)

Discoverer — F. Herwig 1900



Aniline → (alk.) J acid → (alk.) J acid

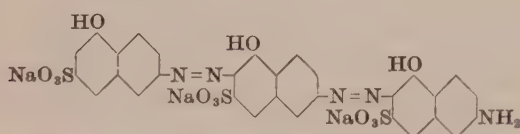
Bayer Co., *BP* 2683/00; *USP* 673079; *FP* 296993; *GP* 129494
 (*Fr.* 6, 945)
BIOS 1548, 163
FIAT 764 — Benzobordo 6B

HNO_3 conc. — partial solution (dull violet)
 Aqueous solution + HCl conc. — wine red, ppt;
 + NaOH conc. — bordeaux ppt.

Soluble in water (magenta red)
 Slightly soluble in ethanol (pink)
 Insoluble in other organic solvents
 H_2SO_4 conc. — blue; on dilution — orange to reddish brown
 (red ppt.)

27685 Direct Dye

Diamine Nitrazol Violet R (C)



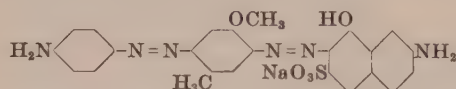
J acid → (alk.) J acid → (alk.) J acid

Fastness Properties (C), coupled with diazotised *p*-nitroaniline: Acid (organic) 4, Alkali 5, Light 3,
 Washing 2-3, Water 3
 Dischargeability, very good
 Cassella Co., *GP ap.* C21973 (*Fr.* 12, 346)

Slightly soluble in water (wine red)
 Very slightly soluble in ethanol
 H_2SO_4 conc. — deep blue; on dilution — wine red
 Aqueous solution + HCl conc. — bordeaux ppt;
 + NaOH conc. — violet ppt.

27700 C.I. Direct Black 17 (Greenish grey → Greenish black)

Discoverer — Agfa 1896



(a) *p*-Nitroaniline → Cresidine → (alk.) Gamma acid;
 and reduce the nitro group

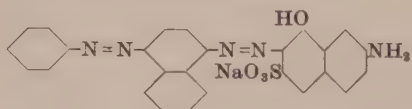
(b) *p*-Aminoacetanilide → Cresidine → (alk.) Gamma acid;
 and hydrolyse the acetamido group

FIAT 764 — Sambesischwarz D "F"

Soluble in water (violet black) and ethanol (greyish violet)
 H_2SO_4 conc. — dark bluish green; on dilution — orange brown
 (ppt.)
 Aqueous solution + HCl conc. — dark brown, ppt;
 + NaOH conc. — greyish violet ppt.

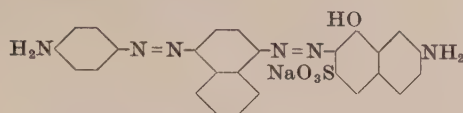
27710 C.I. Direct Black 3 (Reddish grey)

Agfa, *GP ap.* A3743 (*Fr.* 4, 742)
FIAT 764 — Neutralgrau GF



Aniline → 1-Naphthylamine → (alk.) Gamma acid

Moderately soluble in water (violet grey to black)
 Slightly soluble in ethanol
 H_2SO_4 conc. — greyish blue (+ violet black); on dilution —
 corinth
 Aqueous solution + HCl conc. — corinth;
 + NaOH conc. — greyish black, ppt.

27715 Direct Dye

p-Nitroaniline → 1-Naphthylamine → (alk.) Gamma acid;
and reduce the nitro group

Aqueous solution + HCl — dark violet ppt;
+ NaOH — soluble violet ppt.

Discoverer — T. Diehl 1892

Nyanza Black B (A)

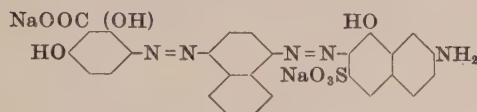
Dyes cotton or wool from a neutral dyebath. Dyed on cotton it may be developed with, for example, 2-naphthol to give improvement in wet-fastness

Agfa, BP 277/92, 6630/92; USP 491410, 511688, 512167;
FP 221378; GP 72394 (Fr. 3, 375), GP 80421 (Fr. 4, 986)

JSDC, 8 (1892), 167

Paul, Z. angew. Chem. 9 (1896), 524

Soluble in water (dark violet)
H₂SO₄ conc. — blue; on dilution — violet ppt.

27720 C.I. Direct Black 51 (Bluish grey)

3(and 5)-Aminosalicyclic acid → 1-Naphthylamine
→ (alk.) Gamma acid

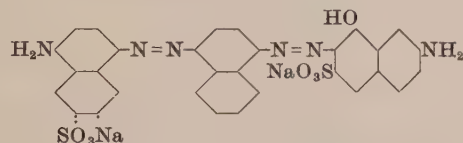
In some brands the first component may consist of 5-aminosalicylic acid alone, e.g. Sirius Black VE

Discoverers — K. Krekeler and R. Lauch 1890

Bayer Co., BP 3303/90; FP 198521; GP 62134 (Fr. 3, 612)

FIAT 764 — Sirius Schwarz L, VE

Soluble in water (violet black)
Slightly soluble in ethanol
Insoluble in other organic solvents
H₂SO₄ conc. — green; on dilution — corinth ppt.
Aqueous solution + HCl conc. — bordeaux to corinth, ppt;
+ NaOH conc. — dullish violet ppt.

27725 C.I. Direct Blue 132 (Greenish navy)*

5(and 8)-Acetamido-8(and 5)-amino-2-naphthalenesulfonic acid
→ 1-Naphthylamine → (alk.) Gamma acid;
then hydrolyse the acetamido group

* Developed with 2-naphthol

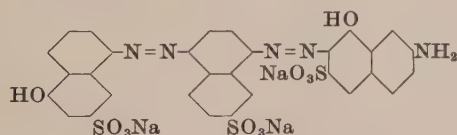
Discoverer — Cassella Co. 1893

Cassella Co., BP 5444/93; USP 533463, 560796; FP 232299;
GP 78831, 79910, (Fr. 4, 732, 733)

FIAT 764 — Diaminogen ex.

Friedländer, Chemikerztg. 26 (1902), 699

Soluble in water
Slightly soluble in ethanol and Cellosolve
H₂SO₄ conc. — greenish black; on dilution — dull bluish violet
HNO₃ conc. — brown
HCl conc. — black, slightly soluble
Aqueous solution + HCl — reddish blue ppt;
+ NaOH — reddish violet ppt.

27740 C.I. Mordant Black 74 (Bluish black)*

M acid → 1,7-Cleve's acid → (alk.) Gamma acid

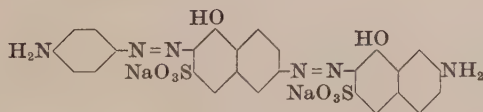
* Aftertreated with dichromate

Discoverer — W. Kirst 1937

I.G., BP 497935; USP 2248091; FP 847958; GP 710395
(Fr.-Bayer, I-1, 1109)

FIAT 764 — Autazolchromschwarz BA

Soluble in water (violet black)
Insoluble in ethanol
H₂SO₄ conc. — greenish blue; on dilution — reddish blue
Aqueous solution + HCl conc. — reddish blue ppt;
+ NaOH conc. — reddish blue, ppt.

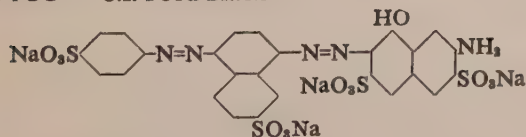
27750 Direct Dye

p-Aminoacetanilide → (alk.) J acid → (alk.) Gamma acid;
then hydrolyse the acetamido group

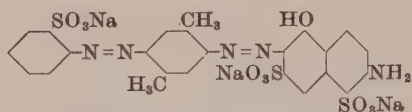
Discoverer — Badische Co.

Oxamine Black JG conc. (A)

Soluble in water (violet black)
Slightly soluble in ethanol (pale violet)
H₂SO₄ conc. — deep blue; on dilution — reddish brown
Aqueous solution + HCl conc. — wine red ppt;
+ NaOH conc. — bordeaux

27755 C.I. Food Black 2

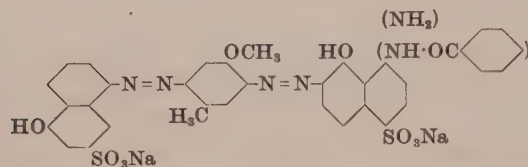
Sulfanilic acid → 1,7 Cleve's acid → (alk.) 2R acid

27760 C.I. Direct Violet 16 (Reddish violet)

o-Aminobenzenesulfonic acid → 2,5-Xyldine
→ 6-Amino-1-naphthol-3,5-disulfonic acid

Discoverers — L. Hesse, O. Günther and A. Zart 1908
Bayer Co., BP 4767/09; USP 933448; GP 237742 (*Fr.* 10, 901)
FIAT 764 — Papierrechtbordo B

Very soluble in water and ethanol (magenta red)
H₂SO₄ conc. — greenish blue; on dilution — violet
Aqueous solution + HCl conc. — bordeaux ppt;
+ NaOH conc. — corinth

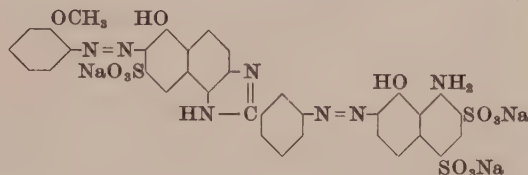
27770 C.I. Direct Black 96 (Bluish black)*

M acid → Cresidine → [S acid (0.5 mol.)
N-Benzoyl S acid (0.5 mol.)]

* Coupled with diazotised *p*-nitroaniline

Discoverer — R. Huss 1940
I.G., USP 2321816; FP 870239; GP 742252 (*Fr.-Bayer*, I-1, 1143)
FIAT 764 — Nitrazolschwarz M

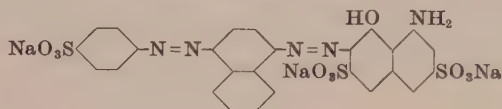
Soluble in water (navy blue)
Moderately soluble in ethanol (reddish blue)
H₂SO₄ conc. — dullish blue green; on dilution — dullish violet
Aqueous solution + HCl conc. — violet black, ppt.
+ NaOH conc. — dark blue

27780 C.I. Direct Red 55 (Bluish red)

o-Anisidine → 2-(*m*-Aminophenyl)-6-hydroxy-1*H*-naphth[1,2]imidazole-8-sulfonic acid → (*alk.*) Chicago acid

Discoverer — Cassella Co.
FIAT 764 — Diaminbrillantrubin S

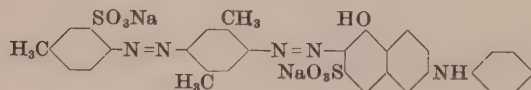
Soluble in water (magenta red)
Moderately soluble in ethanol (wine red)
H₂SO₄ conc. — violet (+ blue); on dilution — rubine red
Aqueous solution + HCl conc. — wine red ppt;
+ NaOH conc. — red ppt.

27790 C.I. Acid Black 18 (Bluish black)

Sulfanilic acid → 1-Naphthylamine → (*alk.*) H acid

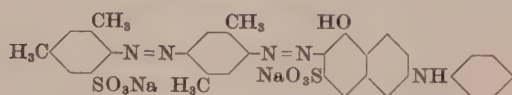
Discoverer — R. Taggesell 1898
Schoellkopf, Hartford & Hanna Co., USP 618963

Soluble in water (bluish black)
Very soluble in Cellosolve
Insoluble in other organic solvents
H₂SO₄ conc. — dark green; on dilution — bluish black ppt.
HNO₃ conc. — dark green solution, turns maroon
NaOH 10% — reddish black solution

27850 C.I. Direct Violet 41 (Reddish violet)

6-Amino-*m*-toluenesulfonic acid → 2,5-Xyldine
→ (*alk.*) *N*-Phenyl J acid

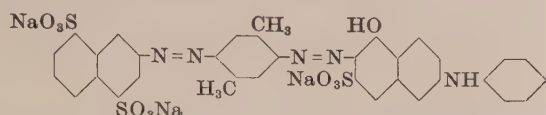
Soluble in water and ethanol
Slightly soluble in acetone
H₂SO₄ conc. — bluish green
HCl conc. — insoluble
NaOCl — brownish violet

27855 C.I. Direct Violet 7 (Violet)

2-Amino-3,5-xylenesulfonic acid → 2,5-Xyldine
→ (*alk.*) *N*-Phenyl J acid

Discoverers — L. Hesse, O. Günther and A. Zart 1908
Bayer Co., BP 4767/09; USP 933446, 933447, 933448, 933562;
FP 402120; GP 237742 (*Fr.* 10, 901)
BIOS 1548, 164
FIAT 764 — Brillantbenzoechtviolett RRL

Soluble in water (magenta red to reddish violet)
Moderately soluble in ethanol
H₂SO₄ conc. — turquoise blue; on dilution — violet
Aqueous solution + HCl conc. — bluish violet ppt;
+ NaOH conc. — bordeaux ppt.

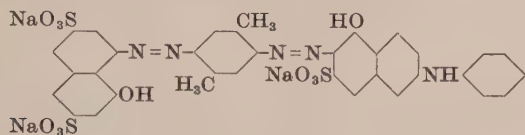
27860 C.I. Direct Violet 26 (Bright violet)

3-Amino-1,5-naphthalenedisulfonic acid \rightarrow 2,5-Xylidine
 \rightarrow (alk.) *N*-Phenyl J acid

Discoverer — Agfa 1910

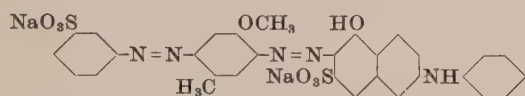
FIAT 764 — Brillantcongovielett R

Soluble in water (reddish violet)
 Moderately soluble in ethanol (magenta to red to reddish violet)
 H_2SO_4 conc. — turquoise blue
 Aqueous solution + HCl conc. — violet, ppt;
 + NaOH conc. — bordeaux ppt.

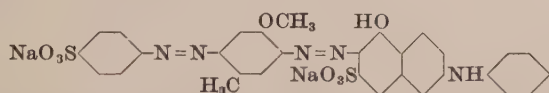
27865 C.I. Direct Violet 57 (Bluish violet)

H acid \rightarrow 2,5-Xylidine \rightarrow (alk.) *N*-Phenyl J acid

Soluble in water (bluish violet)
 Slightly soluble in ethanol
 H_2SO_4 conc. — greenish blue; on dilution — violet ppt.
 Aqueous solution + HCl conc. — violet ppt;
 + NaOH conc. — violet

27880 C.I. Direct Violet 31 (Bluish violet)

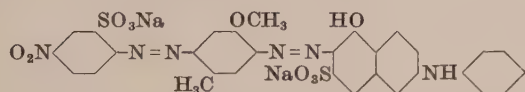
Metanilic acid \rightarrow Cresidine \rightarrow (alk.) *N*-Phenyl J acid

27885 C.I. Direct Violet 9 (Bluish violet)

Sulfanilic acid \rightarrow Cresidine \rightarrow (alk.) *N*-Phenyl J acid

Discoverers — L. Hesse, O. Günther and A. Zart (Bayer Co.) 1907
 FIAT 764 — Brillantbenzovielett B

Soluble in water (reddish violet) and in Cellosolve
 Slightly soluble in ethanol
 Insoluble in other organic solvents
 H_2SO_4 conc. — bluish green; on dilution — violet ppt;
 HNO_3 conc. — reddish brown solution
 Aqueous solution + HCl conc. — violet ppt;
 + NaOH conc. — violet, ppt.

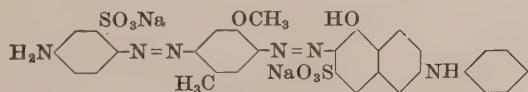
27890 C.I. Direct Blue 29 (Reddish blue)

2-Amino-5-nitrobenzenesulfonic acid \rightarrow Cresidine
 \rightarrow (alk.) *N*-Phenyl J acid

Discoverer — J. Baddiley 1926

Brit. Dye. Corp., BP 263319; USP 1757503; GP ap. B134689
 (Fr. 16, 1624)

Soluble in water and ethanol (violet)
 H_2SO_4 conc. — yellowish green; on dilution — pale brown
 Aqueous solution + NaOH conc. — bluish green, blackish blue ppt.

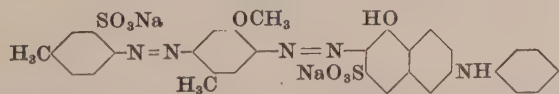
27895 C.I. Direct Blue 145 (Blue)*

2-Amino-5-nitrobenzenesulfonic acid \rightarrow Cresidine
 \rightarrow (alk.) *N*-Phenyl J acid;

and reduce the nitro group with sodium sulfide

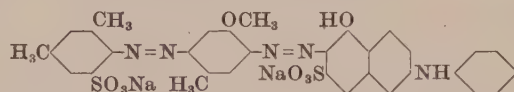
* Developed with 2-naphthol

Soluble in water (violet)
 H_2SO_4 conc. — blue; on dilution — violet ppt.
 Aqueous solution + HCl conc. — bluish violet ppt;
 + NaOH conc. — dark violet ppt.

27900 C.I. Direct Violet 40 (Bluish violet)

6-Amino-*m*-toluenesulfonic acid \rightarrow Cresidine
 \rightarrow (alk.) *N*-Phenyl J acid

Soluble in water and ethanol
 Slightly soluble in acetone
 H_2SO_4 conc. — bluish green solution
 HNO_3 conc. — orange brown solution
 NaOH — violet

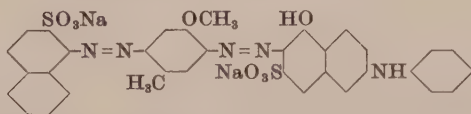
27905 C.I. Direct Violet 51 (Bluish violet)

2-Amino-3,5-xylenesulfonic acid → Cresidine
→ (alk.) *N*-Phenyl J acid

Aqueous solution + HCl conc. — blue ppt;
+ NaOH conc. — violet ppt.

Discoverers — L. Hesse, O. Günther and A. Zart 1908
Bayer Co., BP 4767/09; USP 933562; FP 402120; GP 237742
(Fr. 10, 901)
BIOS 1548, 170
FIAT 764 — Brillantbenzoechtviolett BL, Siriusviolett BB

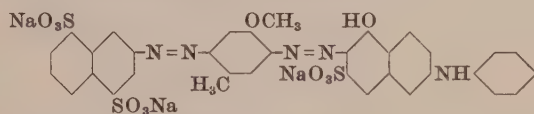
Very soluble in water (reddish violet)
Soluble in Cellosolve
Slightly soluble in ethanol and acetone
Insoluble in other organic solvents
H₂SO₄ conc. — dull bluish green; on dilution — blue
HNO₃ conc. — bluish green, turns dark brown

27910 C.I. Direct Violet 11 (Bluish violet)

1-Amino-2-naphthalenesulfonic acid → Cresidine
→ (alk.) *N*-Phenyl J acid

Discoverer — Cassella Co. 1914
FIAT 764 — Diaminechtviolett BBN

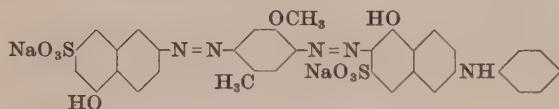
Very soluble in water (violet) and ethanol (reddish violet)
H₂SO₄ conc. — olive green; on dilution — dullish blue
Aqueous solution + HCl conc. — bluish green ppt;
+ NaOH conc. — violet ppt.

27915 C.I. Direct Violet 35 (Bluish violet)

3-Amino-1,5-naphthalenedisulfonic acid → Cresidine
→ (alk.) *N*-Phenyl J acid

Discoverer — Agfa 1910
FIAT 764 — Brillantcongoblau 5R

Soluble in water (deep violet)
Moderately soluble in ethanol (reddish violet)
H₂SO₄ conc. — turquoise blue; on dilution — reddish blue
Aqueous solution + HCl conc. — blue ppt;
+ NaOH conc. — violet ppt.

27920 Direct Dye

J acid → Cresidine → (alk.) *N*-Phenyl J acid

Aqueous solution + HNO₃ conc. — dull violet ppt;
+ NaOH conc. — unchanged

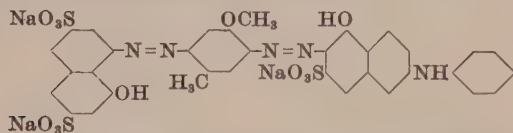
Discoverers — R. Gast 1910; G. Kalischer 1913

Diamine Nitrazol Blue BR (C)

Fastness Properties (C), coupled with diazotised *p*-nitro-aniline: Acid (organic) 4, Alkali 5, Light 2, Washing 2-3, Water 3
Dischargeability, very good

Cassella Co., USP 1020756 (Gast), 1079415 (Kalischer); GP ap. C21973 (Fr. 12, 346)

Soluble in water (violet)
Slightly soluble in ethanol (reddish violet)
H₂SO₄ conc. — bluish green; on dilution — corinth

27925 C.I. Direct Blue 67 (Reddish blue)

O-Phenylsulfonyl H acid → Cresidine → (alk.) *N*-Phenyl J acid;
and hydrolyse the phenylsulfonyl group. The dye can also be made directly from H acid

Discoverers — O. Günther and L. Hesse 1906

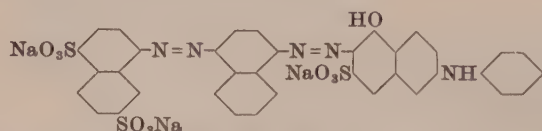
Bayer Co., BP 14248/07; USP 877643, 877644, 897529, 898217;
FP 380540; GP 198102, 199175, 200115, 202116, (Fr. 9, 384, 386, 387, 388)

BIOS 1548, 135

FIAT 764 — Siriuslichtblau F3R

PB 74722, 1185 (Manufacture from H acid directly)

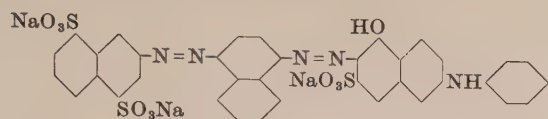
Soluble in water (violet), ethanol (blue) and Cellosolve (bright blue)
Insoluble in other organic solvents
H₂SO₄ conc. — bluish green; on dilution — violet ppt.
HNO₃ conc. — partial solution (olive)
Aqueous solution + HCl conc. — reddish blue;
+ NaOH conc. — reddish violet ppt.

27940 C.I. Direct Blue 55 (Reddish blue)

4-Amino-1,6-naphthalenedisulfonic acid → 1-Naphthylamine
→ (alk.) *N*-Phenyl J acid

Discoverer — Agfa 1910
FIAT 764 — Brillantcongoblau BFL

Soluble in water (deep violet)
Moderately soluble in ethanol
H₂SO₄ conc. — dull bluish green; on dilution — violet
Aqueous solution + HCl conc. — reddish blue, ppt.
+ NaOH conc. — reddish violet, ppt.

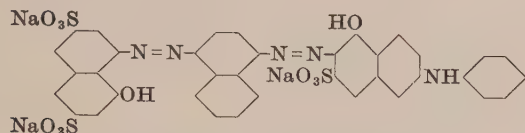
27945 Direct Dye

3-Amino-1,5-naphthalenedisulfonic acid → 1-Naphthylamine
→ (alk.) *N*-Phenyl J acid

Discoverer — Agfa 1910

Brilliant Congo Blue B (A)

Soluble in water (violet)
Slightly soluble in ethanol
H₂SO₄ conc. — green; on dilution — blue
Aqueous solution + HCl conc. — blue ppt;
+ NaOH conc. — dullish violet ppt.

27950 Direct Dye

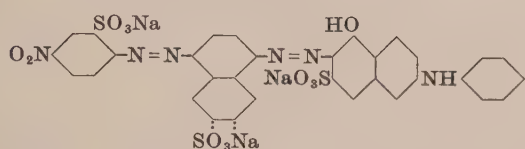
H acid → 1-Naphthylamine → (alk.) *N*-Phenyl J acid

Discoverers — O. Günther and L. Hesse 1906

Brilliant Fast Blue GG (By)

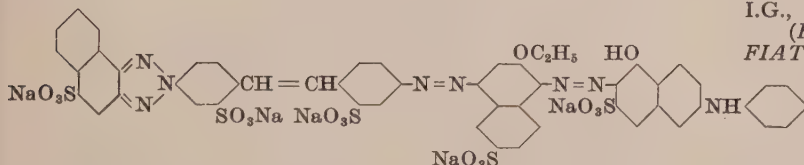
Bayer Co., USP 877643, 877644, 897529, 898217; FP 380540;
GP 198102, 199175, 200115, 202116, (Fr. 9, 384-388)

Soluble in water (reddish blue)
Slightly soluble in ethanol (pale blue)
H₂SO₄ conc. — grey green; on dilution — violet
Aqueous solution + HCl conc. — reddish blue;
+ NaOH conc. — violet

27960 C.I. Direct Blue 54 (Blue)

2-Amino-5-nitrobenzenesulfonic acid → 1,6-and 1,7)-Cleve's acid
→ (alk.) *N*-Phenyl J acid

H₂SO₄ conc. — green; on dilution — dark blue
HNO₃ conc. — brownish orange solution
Aqueous solution + HCl conc. — dark blue, ppt.
+ NaOH conc. — blue, ppt.

27970 C.I. Direct Green 34 (Green)

Oxidise the dye

4-Amino-4'-nitro-2,2'-stilbenedisulfonic acid → Naphthionic acid
with copper sulfate to the triazole and reduce the nitro group with sodium
sulfide to give amine A; then

A → 5-Amino-6-ethoxy-2-naphthalenesulfonic acid
→ (alk.) *N*-Phenyl J acid

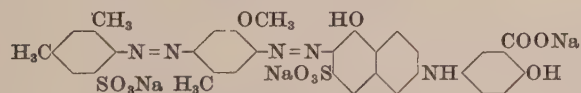
Discoverers — H. Schindhelm and C. T. Schultis 1937

I.G., BP 503576; USP 2175552; FP 836665; GP 695404

(Fr.-Bayer, I-1, 1197)

FIAT 764 — Siriuslichtgruen BTL

Soluble in water (dullish green)
Slightly soluble in ethanol (pale olive grey)
H₂SO₄ conc. — bluish grey; on dilution — bluish green
Aqueous solution + HCl conc. — olive to bluish grey ppt;
+ NaOH conc. — dull bluish green ppt.

27980 C.I. Direct Blue 116 (Reddish blue)

2-Amino-3,5-xylenesulfonic acid
→ Cresidine → *N*-(3-Carboxy-4-hydroxyphenyl) J acid

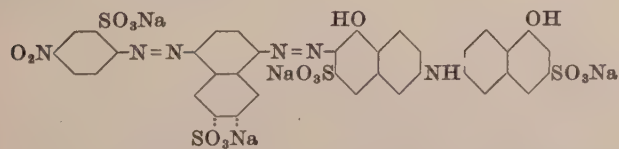
Discoverers — H. Jordan and W. Neelmeier 1910

Bayer Co., BP 4767/09; USP 933562; FP 402120; GP 237742

(Fr. 10, 901)

FIAT 764 — Siriusviolett 3B

Very soluble in water (reddish violet)
Soluble in ethanol
H₂SO₄ conc. — bluish green; on dilution — blue
Aqueous solution + HCl conc. — dullish blue ppt;
+ NaOH conc. — violet ppt.

27990 Direct Dye

2-Amino-5-nitrobenzenesulfonic acid → 1,6-and 1,7)-Cleve's acid
→ (alk.) Di-J acid

Discoverers — H. Schweitzer and A. Zart 1911

Para Violet 3BL (By)

Fastness Properties (C), coupled with diazotised *p*-nitro-
aniline: Acid (organic) 4, Alkali 5, Light 4,
Washing 3-4, Water 3

Dischargeability, fairly good-good

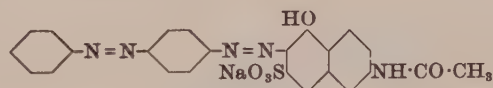
Bayer Co., BP 9433/11; USP 1038209-10; FP 442697; GP 260507
(Fr. 11, 436)

Soluble in water (dull reddish blue)
Slightly soluble in ethanol (pale violet grey)
H₂SO₄ conc. — bluish green; on dilution — bluish grey

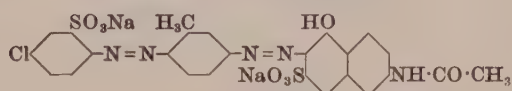
Aqueous solution + HCl conc. — bluish black ppt;
+ NaOH conc. — dark blue ppt.

28100 Direct Dye**Benzo Fast Bordeaux 6BL (By)**

Fierz-David, 155

*p*-Phenylazoaniline → *N*-Acetyl J acid**28105 C.I. Direct Red 8 (Bright bluish red)**

Discoverers — O. Günther, L. Hesse and A. Zart 1909
 Bayer Co., BP 4768/09; USP 931423-4; FP 402126; GP *ap.*
 F25375 (*Fr.* 10, 896)
 FIAT 764 — Siriusrubin R

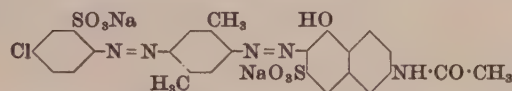


2-Amino-5-chlorobenzenesulfonic acid → *m*-Toluidine
 → *N*-Acetyl J acid

Soluble in water (magenta red)
 Slightly soluble in ethanol
 H₂SO₄ conc. — blue; on dilution — pink
 HNO₃ conc. — violet ppt.
 Aqueous solution + HCl conc. — bluish red to bordeaux ppt;
 + NaOH conc. — reddish violet ppt.

28110 C.I. Direct Red 77 (Bordeaux)

Discoverers — O. Günther, L. Hesse and A. Zart 1908
 Bayer Co., BP 4768/09; USP 931423-4; FP 402126; GP *ap.*
 F25375 (*Fr.* 10, 896)
 BIOS 1548, 171
 FIAT 764 — Siriusbordo 5B



2-Amino-5-chlorobenzenesulfonic acid → 2,5-Xylydine
 → *N*-Acetyl J acid

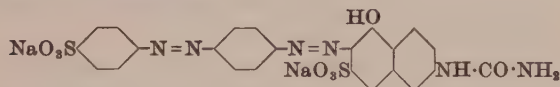
Soluble in water (magenta red to bordeaux) and in ethanol
 H₂SO₄ conc. — turquoise blue; on dilution — corinth to reddish brown (violet ppt.)
 HNO₃ conc. — violet brown ppt.
 Aqueous solution + HCl conc. — corinth;
 + NaOH conc. — violet; + NaOH 10% — slightly bluer

28120 Direct Dye

Discoverer — M.L.B.

Dianil Fast Red 6BL (MLB)

Fastness Properties (C): Acid (organic) 3, Alkali 4,
 Light 4, 4, 4-5, Washing 1-2, Water 1
 Dischargeability: neutral and alkaline, good



p-(*p*-Aminophenylazo)benzenesulfonic acid
 → 6-Ureido-1-naphthol-3-sulfonic acid

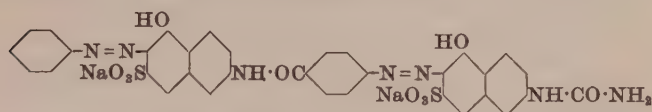
Soluble in water (red)
 Moderately soluble in ethanol
 H₂SO₄ conc. — deep blue; on dilution — orange red brown;
 Aqueous solution + HCl conc. — orange brown
 + NaOH conc. — violet

28125 Direct Dye (Bright yellowish red)

Discoverers — C. O. Müller and A. Otto 1906

Dianil Fast Scarlet GS (MLB)

Fastness Properties (C): Acid (organic) 2-3, Alkali 3-4,
 Light 4, 4, 4-5, Washing 2, Water 1-2
 Dischargeability, good



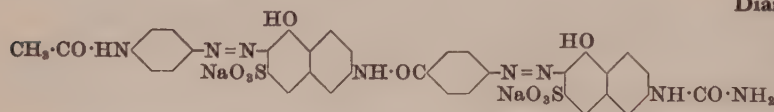
Aniline → *N*-*p*-Aminobenzoyl J acid
 → 6-Ureido-1-naphthol-3-sulfonic acid

M.L.B., BP 9548/07; USP 888837; GP 205662 (*Fr.* 9, 395)**28130 Direct Dye (Dull red)**

Discoverers — C. O. Müller and A. Otto 1906

Dianil Fast Scarlet 6BS (MLB)

Fastness Properties (C): Acid (organic) 5, Alkali 5, Light 3,
 Washing 1-2, Water 2
 Dischargeability, good



p-Aminoacetanilide → *N*-*p*-Aminobenzoyl J acid
 → 6-Ureido-1-naphthol-3-sulfonic acid

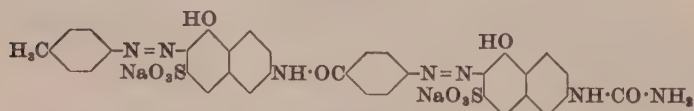
Patents as for C.I.28125

28135 Direct Dye (Bright red)

Discoverers — C. O. Müller and A. Otto 1906

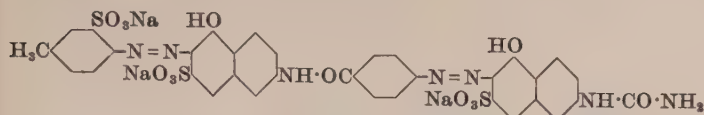
Dianil Fast Scarlet RS (MLB)

Fastness Properties (C): Acid (organic) 4, Alkali 5,
 Light 3, Washing 2, Water 1-2
 Dischargeability, good



p-Toluidine → *N*-*p*-Aminobenzoyl J acid
 → 6-Ureido-1-naphthol-3-sulfonic acid

Patents as for C.I.28125

28140 Direct Dye (Bright red)

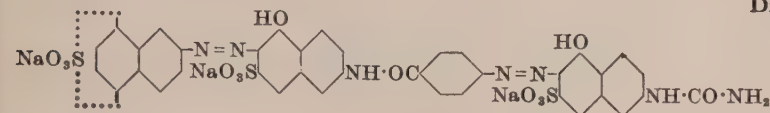
6-Amino-*m*-toluenesulfonic acid → *N*-*p*-Aminobenzoyl J acid
→ 6-Ureido-1-naphthol-3-sulfonic acid

Discoverers — C. O. Müller and A. Otto 1906

Dianil Fast Scarlet RS extra (MLB)

Fastness Properties (C): Acid (organic) 4, Alkali 5,
Light 3, Washing 2, Water 1-2
Dischargeability, good

Patents as for C.I.28125

28145 Direct Dye (Red)

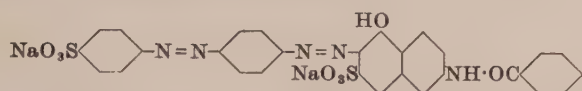
6(and 7)-Amino-1-naphthalenesulfonic acid
→ *N*-*p*-Aminobenzoyl J acid
→ 6-Ureido-1-naphthol-3-sulfonic acid

Discoverers — C. O. Müller and A. Otto 1906

Dianil Fast Scarlet 4BL (MLB)

Fastness Properties (C): Acid (organic) 4, Alkali 4,
Light 3, Washing 1-2, Water 1-2
Dischargeability, poor

Patents as for C.I.28125

28160 C.I. Direct Red 81 (Bright red)

p-(*p*-Aminophenylazo)benzenesulfonic acid → *N*-Benzoyl J acid

Aqueous solution + HCl conc. — yellowish olive brown ppt;
+ NaOH conc. — violet ppt.

Discoverers — L. Hesse, O. Günther and A. Zart 1909

Bayer Co., BP 4768/09; USP 931423-4; FP 402126; GP *ap.*
F25375 (*Fr.* 10, 896)

BIOS 1548, 160

FIAT 764 — Siriusrot 4B

Wanner, *Z. angew. Chem.* 38 (1925), 513

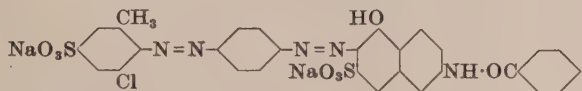
Soluble in water (magenta red) and Cellosolve

Slightly soluble in ethanol

Insoluble in other organic solvents

H₂SO₄ conc. — deep blue; on dilution — pale orange brown ppt.

HNO₃ conc. — bright blue solution, turns reddish brown

28165 C.I. Direct Red 108 (Bright bluish red)

4-Amino-5-chloro-*m*-toluenesulfonic acid → Aniline
→ *N*-Benzoyl J acid

Eukanol Brilliant Scarlet O (IG) was the ammonium salt

Discoverers — A. Ossenbeck and A. Zart 1910

Bayer Co., BP 316/11; USP 1027148; FP 436576; GP *ap.* F31431
(*Fr.* 11, 436)

FIAT 764 — Siriusrot BB

Eukanolbrillantscharlach O

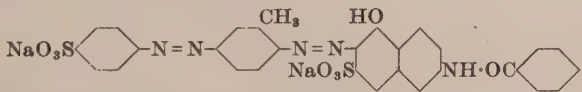
Soluble in water (red)

Slightly soluble in ethanol

H₂SO₄ conc. — dark blue; on dilution — red

Aqueous solution + HCl conc. — reddish orange brown ppt;

+ NaOH conc. — violet ppt.

28170 C.I. Direct Red 90 (Bluish red)

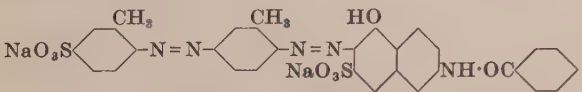
Sulfanilic acid → *o*-Toluidine → *N*-Benzoyl J acid

Soluble in water (reddish violet)

H₂SO₄ conc. — blue; on dilution — dark red ppt.

Aqueous solution + HCl — dark violet ppt;

+ NaOH — reddish violet ppt.

28175 Direct Dye (Bluish red)

4-(4-Amino-*m*-tolylazo)-*m*-toluenesulfonic acid → *N*-Benzoyl J acid

Discoverer — M.L.B.

Dianil Fast Red 12BL (MLB)

Fastness Properties (C): Acid (organic) 2-3, Alkali 4,
Light 4, 4, 5, Washing 1-2, Water 1
Dischargeability: neutral and alkaline, very good

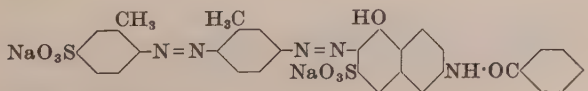
Soluble in water (magenta to wine red)

Moderately soluble in ethanol

H₂SO₄ conc. — turquoise blue; on dilution — wine red

Aqueous solution + HCl conc. — violet ppt;

+ NaOH conc. — violet ppt.

28180 C.I. Direct Red 85 (Bluish red)

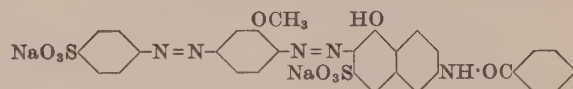
4-Amino-*m*-toluenesulfonic acid → *m*-Toluidine → *N*-Benzoyl J acid

Soluble in water and ethanol (cerise)

H₂SO₄ conc. — bluish green; on dilution — reddish violet ppt.

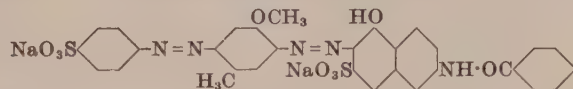
Aqueous solution + HCl — violet ppt;

+ NaOH — violet ppt.

28190 C.I. Direct Violet 63 (Reddish violet)

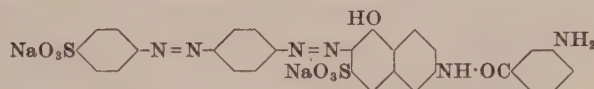
Sulfanilic acid → *o*-Anisidine → *N*-Benzoyl J acid

Soluble in water (reddish violet)
H₂SO₄ conc. — greenish blue; on dilution — dark violet ppt.
Aqueous solution + HCl — dark reddish blue ppt.

28200 C.I. Direct Violet 64 (Reddish violet)

Sulfanilic acid → Cresidine → *N*-Benzoyl J acid

Soluble in water (reddish purple)
H₂SO₄ conc. — bluish green; on dilution — bluish violet ppt.
Aqueous solution + HCl conc. — blue ppt;
+ NaOH — blue ppt.

28210 C.I. Direct Red 153 (Red → bluish red)***28211 C.I. Direct Red 154 (Bluish red)***

p-(*p*-Aminophenylazo)benzenesulfonic acid
→ *N*-*m*-Aminobenzoyl J acid

The coupling medium for Diazo Fast Red 7BL is weakly alkaline with sodium carbonate and for 8BL is sodium bicarbonate

* Developed with 2-naphthol

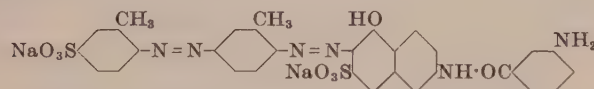
Discoverers — O. Günther, L. Hesse and A. Zart 1909

Bayer Co., BP 4767/09; USP 931423; FP 402126; GP ap. F25375 (Fr. 10, 896)

FIAT 764 — Diazolichtrot 7BL, 8BL

Nishi, J. Soc. Chem. Ind. (Japan), 43 (1940), 305

Soluble in water (red) and ethanol (brownish orange)
H₂SO₄ conc. — deep blue (+ magenta); on dilution — orange brown
Aqueous solution + HCl conc. — olive brown ppt;
+ NaOH conc. — corinth ppt.

28215 C.I. Direct Red 127 (Bordeaux)*

4-(4-Amino-*m*-tolylazo)-*m*-toluenesulfonic acid
→ *N*-*m*-Aminobenzoyl J acid

* Developed with 2-naphthol

Soluble in water (reddish violet to bordeaux)

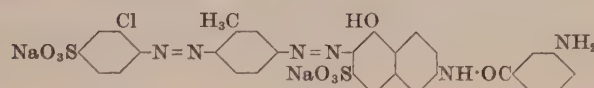
Slightly soluble in Cellosolve

Very slightly soluble in ethanol

Insoluble in other organic solvents

H₂SO₄ conc. — bluish green; on dilution — yellowish orange; bluish green solution, turns yellowish brown

Aqueous solution + HCl conc. — reddish bordeaux;
+ NaOH conc. — violet red solution and ppt.

28220 Direct Dye

3-Chlorosulfanilic acid → *m*-Toluidine → *N*-*m*-Aminobenzoyl J acid

Aqueous solution + HCl conc. — bordeaux, ppt;
+ NaOH conc. — corinth, ppt.

Discoverers — A. Blank, H. Jordan and W. Neelmeier 1911

Diazo Fast Bordeaux BL (By)

Fastness Properties (C), developed with 2-naphthol: Acid 3, Alkali 5, Light 4-5, Washing 3, Water 3-4

Dischargeability: neutral and alkaline, good — very good

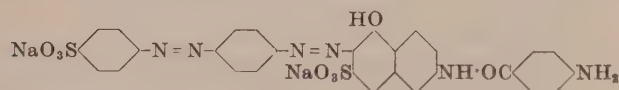
Bayer Co., GP ap. F32766 (Fr. 11, 441)

FIAT 764 — Diazolichtbordo BL

Very soluble in water (bluish red)

Soluble in ethanol (magenta)

H₂SO₄ conc. — blue; on dilution — reddish brown

28230 C.I. Direct Red 117 (Bluish red)*

p-(*p*-Aminophenylazo)benzenesulfonic acid
→ *N*-*p*-Aminobenzoyl J acid

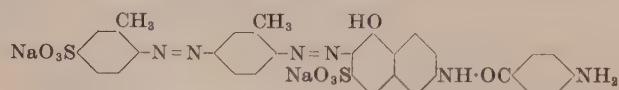
* Developed with 2-naphthol

Soluble in water (bluish red)

H₂SO₄ conc. — bluish violet; on dilution — reddish brown ppt.

Aqueous solution + HCl conc. — brown ppt;

+ NaOH conc. — bluish violet

28240 C.I. Direct Red 127A (Bluish red)*

4-(4-Amino-*m*-tolylazo)-*m*-toluenesulfonic acid
→ *N*-*p*-Aminobenzoyl J acid

* Developed with 2-naphthol

Discoverers — O. Günther and L. Hesse 1909

Bayer Co., BP 4767/09; USP 931423; FP 402126; GP ap. F25375 (Fr. 10, 896)

FIAT 764 — Diazolichtbordo 5BL

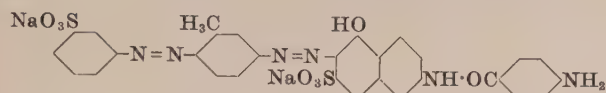
Soluble in water (bluish red)

Moderately soluble in ethanol (magenta)

H₂SO₄ conc. — blue; on dilution — reddish brown

Aqueous solution + HCl conc. — reddish orange brown ppt;

+ NaOH conc. — bordeaux ppt.

28250 C.I. Direct Red 121 (Bluish red → Bordeaux)*

Metanilic acid → *m*-toluidine → *N*-*p*-Aminobenzoyl J acid

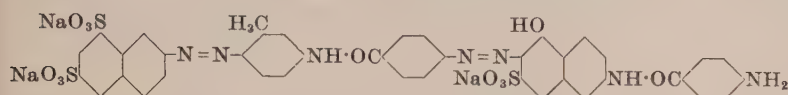
* Developed with 2-naphthol

Discoverers — A. Blank, H. Jordan and W. Neelmeier 1911
Bayer Co., *GP ap.* F25375 (*Fr.* 10, 896); F32766 (*Fr.* 11, 441)
FIAT 764 — Diazolichtbordo FBL

Very soluble in water (cherry red)
Soluble in ethanol (magenta)
H₂SO₄ conc. — blue; on dilution — reddish brown
Aqueous solution + HCl conc. — reddish brown;
+ NaOH conc. — bordeaux, ppt.

28255 C.I. Direct Orange 74 (Reddish orange)*

Discoverer — M.L.B.



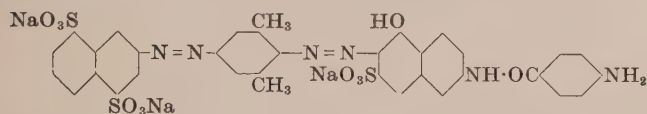
7-Amino-1,3-naphthalenedisulfonic acid → *m*-Toluidine
— condense with *p*-nitrobenzoyl chloride, then reduce the nitro group to
amino → *N*-*p*-Aminobenzoyl J acid

* Developed with 2-naphthol

Soluble in water (orange brown)
Slightly soluble in ethanol (brownish orange)
H₂SO₄ conc. — bluish red; on dilution — orange brown
Aqueous solution + HCl conc. — dark brown ppt;
+ NaOH conc. — orange brown ppt.

28260 C.I. Direct Red 150 (Bordeaux)*

Discoverer — F. Suckfüll (I.G.) 1936
FIAT 764 — Diazorubin FBD



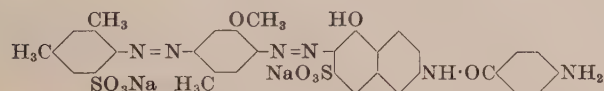
3-Amino-1,5-naphthalenedisulfonic acid → 2,6-Xylidine
→ *N*-*p*-Aminobenzoyl J acid

* Developed with 2-naphthol

Soluble in water (rubine) and in ethanol (magenta)
H₂SO₄ conc. — deep blue; on dilution — red
Aqueous solution + HCl conc. — bordeaux ppt;
+ NaOH conc. — bordeaux to corinth

28270 C.I. Direct Violet 72 (Dull violet)*

Discoverers — L. Hesse, O. Günther, A. Zart and H. Roos
1909/1937
Bayer Co., *BP* 4768/09; *USP* 931423; *FP* 402126; *GP ap.* F25375
(*Fr.* 10, 896)
FIAT 764 — Diazolichtviolett TL



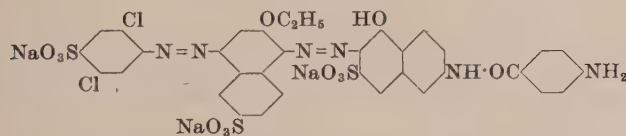
2-Amino-3,5-xylenesulfonic acid → Cresidine
→ *N*-*p*-Aminobenzoyl J acid

* Developed with 2-naphthol

Soluble in water (bordeaux) and ethanol (magenta)
H₂SO₄ conc. — dull greenish blue; on dilution — violet
Aqueous solution + HCl conc. — dark blue ppt;
+ NaOH conc. — dullish violet

28280 C.I. Direct Green 38 (Green)*

Discoverer — O. Günther 1913
Bayer Co., *BP* 20714/13; *USP* 1150675; *FP* 471881; *GP* 273934
(*Fr.* 12, 348)
FIAT 764 — Diazobrillantgruen 3G



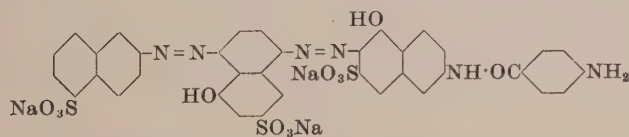
2,5-Dichlorosulfanilic acid
→ 5-Amino-6-ethoxy-2-naphthalenesulfonic acid
(ammonia) → *N*-*p*-Aminobenzoyl J acid

* Developed with methylphenylpyrazolone

Soluble in water (greenish blue)
Very soluble in Cellosolve
Slightly soluble in ethanol
Insoluble in other organic solvents
H₂SO₄ conc. — dull green; on dilution — blue (green ppt.)
HNO₃ conc. — brown solution, turns yellow
Aqueous solution + HCl conc. — blue ppt;
+ NaOH conc. — blue, ppt.

28290 C.I. Direct Green 42 (Bluish green)*

Discoverers — O. Günther and A. Zart 1912
Bayer Co., *BP* 16386/13; *USP* 1101739; *FP* 465347; *GP* 268792
(*Fr.* 11, 440)
FIAT 764 — Diazolichtgruen GF



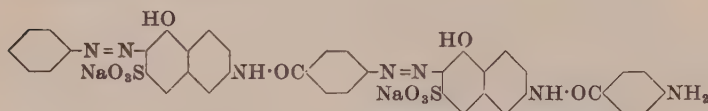
6-Amino-1-naphthalenesulfonic acid → 4-Acetoxy-8-amino-2-
naphthalenesulfonic acid → *N*-*p*-Aminobenzoyl J acid;
and finally hydrolyse the acetic ester group

* Developed with methylphenylpyrazolone

Soluble in water (dark blue)
Slightly soluble in ethanol
H₂SO₄ conc. — dark bluish green; on dilution — violet
Aqueous solution + HCl conc. — dark blue ppt;
+ NaOH conc. — bluish black ppt.

28300 Direct Dye**Diazanil Scarlet GA (MLB)**

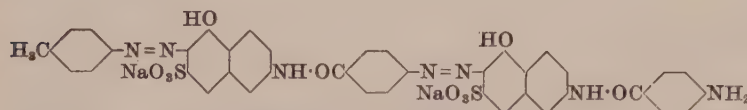
M.L.B., GP 205661, 214497, (Fr. 9, 394, 398)

Aniline → *N*-*p*-Aminobenzoyl J acid → *N*-*p*-Aminobenzoyl J acid**28310 Direct Dye****Diazanil Scarlet BA (MLB)**

Fastness Properties (C), developed with 2-naphthol: Acid (organic) 3-4, Alkali 5, Light 3, Washing 3-4, Water 3

Dischargeability: neutral and alkaline, fair

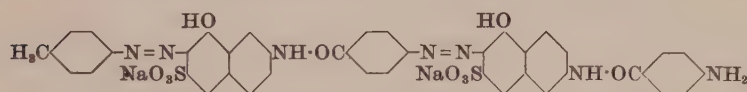
M.L.B., GP 205661, 214497, (Fr. 9, 394, 497)

*p*-Toluidine → *N*-*p*-Aminobenzoyl J acid
→ *N*-*p*-Aminobenzoyl J acid**28320 Direct Dye****Diazanil Scarlet 3BA (MLB)**

Fastness Properties (C), developed with 2-naphthol: Acid (organic) 3-4, Alkali 5, Light 3, Washing 2-3, Water 3

M.L.B., GP 205661, 214497, (Fr. 9, 394, 398)

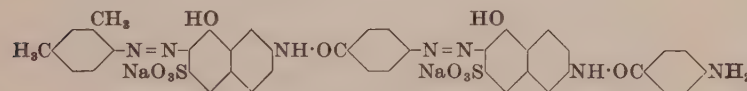
FIAT 764 — Diazanilscharlach 3BA

*p*-Toluidine → *N*-*p*-Aminobenzoyl Gamma acid
→ *N*-*p*-Aminobenzoyl J acidSoluble in water (red) and in ethanol (reddish orange)
H₂SO₄ conc. — reddish violet; on dilution — pale red
Aqueous solution + HCl conc. — red ppt;
+ NaOH conc. — orange brown**28325 Direct Dye****Diazanil Scarlet 4BA (MLB)**

Fastness Properties (C), developed with 2-naphthol: Acid (organic) 3-4, Alkali 5, Light 3, Washing 2-3, Water 3

Dischargeability: neutral and alkaline, fair

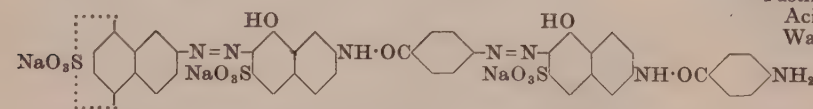
M.L.B., GP 205661, 214497, (Fr. 9, 394, 398)

2,4-Xylidine → *N*-*p*-Aminobenzoyl Gamma acid
→ *N*-*p*-Aminobenzoyl J acidSlightly soluble in water (red) and ethanol (reddish orange)
H₂SO₄ conc. — reddish violet; on dilution — pale red
Aqueous solution + HCl conc. — bordeaux ppt;
+ NaOH conc. — orange brown**28330 Direct Dye****Diazanil Scarlet 6BA (MLB)**

Fastness Properties (C) developed with 2-naphthol: Acid (organic) 3-4, Alkali 5, Light 3, Washing 2-3, Water 3

Dischargeability: neutral and alkaline, fair-fairly good

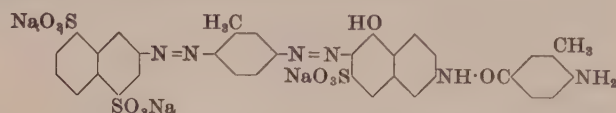
M.L.B., GP 205661, 214497, (Fr. 9, 394, 398)

6(and 7)-Amino-1-naphthalenesulfonic acid
→ *N*-*p*-Aminobenzoyl Gamma acid
→ *N*-*p*-Aminobenzoyl J acid**28340 C.I. Direct Red 130 (Bordeaux)***

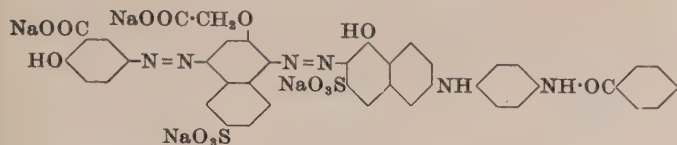
Discoverer — H. Roos 1938

BIOS 1088, 24

FIAT 764 — Diazobordo 7BL

3-Amino-1,5-naphthalenedisulfonic acid
→ *m*-Toluidine → *N*-(4-Amino-*m*-toluoyl) J acidSoluble in water and ethanol (bluish red)
H₂SO₄ conc. — greenish blue; on dilution — orange brown
Aqueous solution + HCl conc. — reddish brown ppt;
+ NaOH conc. — bordeaux

* Developed with 2-naphthol

28350 C.I. Direct Blue 149 (Greenish blue)*

5-Aminosalicylic acid

→ (1-Amino-6-sulfo-2-naphthyloxy)acetic acid

→ *N*-*p*-Benzamidophenyl J acid

Carry out the final coupling in aqueous pyridine medium with the addition of ammonia

* Aftertreated with copper sulfate

Discoverers — O. Bayer and D. Delfs 1936

I.G., BP 484577; USP 2125625; FP 828239; GP 677663

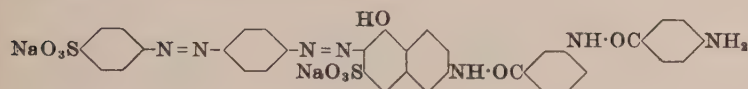
(Fr.-Bayer, I-1, 1177)

BIOS 1548, 113

FIAT 764 — Benzoechothkupperblau F3GL

Soluble in water (blue)

Slightly soluble in ethanol

H₂SO₄ conc. — dark green; on dilution — dark bluish green solution and ppt.Aqueous solution + HCl conc. — dark bluish green ppt;
+ NaOH conc. — bluish green**28360 C.I. Direct Red 152 (Red)****p*-(*p*-Aminophenylazo)benzenesulfonic acid→ *N*-*m*-(*p*-Aminobenzamido)benzoyl J acid

* Developed with 2-naphthol

Discoverers — H. Jordan and W. Neelmeier 1910

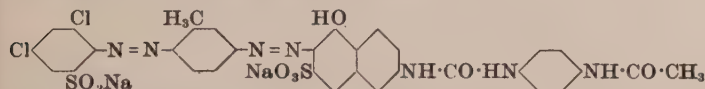
Bayer Co., BP 14735/10; USP 993073; FP 428101; GP 230595

(Fr. 10, 915)

FIAT 764 — Diazolichtrot 5BL

Very soluble in water (magenta)

Slightly soluble in ethanol

H₂SO₄ conc. — greenish blue; on dilution — pink solution and ppt.Aqueous solution + HCl conc. — corinth ppt;
+ NaOH conc. — violet, ppt.**28370 C.I. Direct Red 110 (Bluish red)**

2-Amino-3,5-dichlorobenzenesulfonic acid

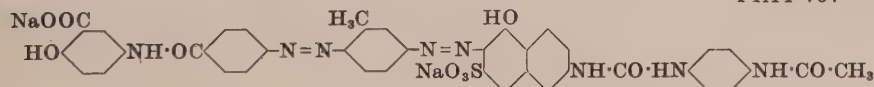
→ *m*-Toluidinomethanesulfonic acid—hydrolyse the methanesulfonic acid group→ 6-(*p*-Acetamidophenylureido)-1-naphthol-3-sulfonic acidTo prepare the final coupling component, phosgenate an equimolecular mixture of J acid and *p*-aminoacetanilide

Discoverers — C. Taube and J. Hilger 1932

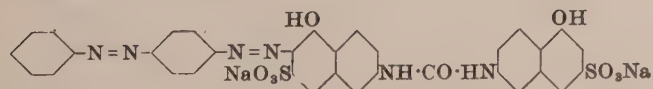
I.G., BP 427973; USP 2026920; FP 762830; GP 614541 (Fr. 22, 1003)

FIAT 764 — Siriuslichtrot 5B

Soluble in water (magenta to bluish red) and in ethanol (red)

H₂SO₄ conc. — deep blue; on dilution — bluish redAqueous solution + HCl conc. — bordeaux ppt;
+ NaOH conc. — bordeaux ppt.**28375 Direct Dye**5-(*p*-Aminobenzamido)salicylic acid → *m*-Toluidine→ 6-(*p*-Acetamidophenylureido)-1-naphthol-3-sulfonic acid**Benzo Fast Chrome Rubine (IG)**

FIAT 764 — Benzoechochromrubin

28390 Direct Dye*p*-Phenylazoaniline → 6,6'-Ureylenebis-1-naphthol-3-sulfonic acid

Discoverers — W. A. Israel and T. Kothe 1899

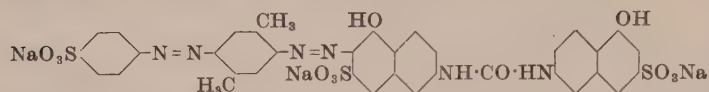
Para Garnet G (By)Fastness Properties (C), coupled with diazotised *p*-nitro-aniline: Acid (organic) 3, Alkali 5, Light 3, Washing 3, Water 3

Dischargeability: fair

Bayer Co., BP 3615/00; USP 662122; FP 297367; GP 122904 (Fr. 6, 954)

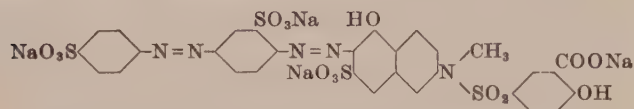
Slightly soluble in water (wine red) and ethanol (bordeaux)

H₂SO₄ conc. — dark blue; on dilution — greyish violetAqueous solution + HCl conc. — dark corinth ppt;
+ NaOH conc. — dark bordeaux ppt.

28400 C.I. Direct Red 189 (Bordeaux)

Sulfanilic acid \rightarrow 2,5-Xylydine
 \rightarrow 6,6'-Ureylenebis-1-naphthol-3-sulfonic acid

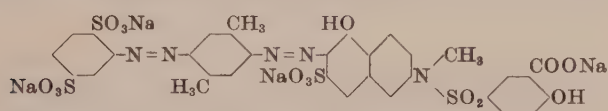
Soluble in water (bordeaux), ethanol and Cellosolve
 Insoluble in other organic solvents
 H_2SO_4 conc. — greenish blue; on dilution — dull reddish blue ppt.
 Aqueous solution + H_2SO_4 10% — pale dull reddish blue;
 + NaOH 10% — pale bordeaux

28410 C.I. Mordant Red 66 (Bluish red)

6-Amino-3,4'-azodibenzenesulfonic acid
 \rightarrow 5-[(5-Hydroxy-7-sulfo-2-naphthyl)methylsulfamoyl]salicylic acid

Discoverers — W. Neelmeier and T. Nocken 1924
 I.G., BP 229330; USP 1602776; FP 592954; GP 416617 (Fr. 15, 482)
 BIOS 1548, 98
 FIAT 764 — Azoldruckrot R ex.

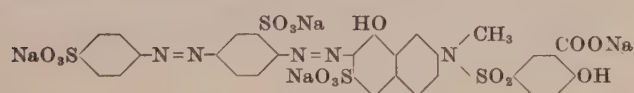
Soluble in water (red)
 Slightly soluble in ethanol (magenta red)
 H_2SO_4 conc. — blue; on dilution — red
 Aqueous solution + HCl conc. — red;
 + NaOH conc. — violet

28415 Mordant Dye (Reddish violet)

2-Amino-*p*-benzenedisulfonic acid \rightarrow 2,5-Xylydine
 \rightarrow 5-[(5-Hydroxy-7-sulfo-2-naphthyl)methylsulfamoyl]salicylic acid

Discoverers — W. Neelmeier and T. Nocken 1924
Azol Printing Bordeaux B extra (By)
 I.G., BP 229330; USP 1602776; FP 592954; GP 416617 (Fr. 15, 482)

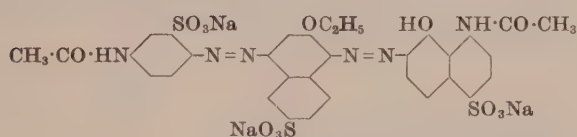
Soluble in water (magenta red)
 Slightly soluble in ethanol
 H_2SO_4 conc. — greenish blue; on dilution — pink
 Aqueous solution + HCl conc. — magenta red;
 + NaOH conc. — bordeaux

28420 C.I. Mordant Red 65 (Bluish red)

6-Amino-3,4'-azodibenzenesulfonic acid
 \rightarrow 5-[(8-Hydroxy-6-sulfo-2-naphthyl)methylsulfamoyl]salicylic acid

Discoverers — W. Neelmeier and T. Nocken 1924
 I.G., BP 229330; USP 1602776; FP 592954; GP 416617 (Fr. 15, 482)
 FIAT 764 — Azoldruckrot BB ex.

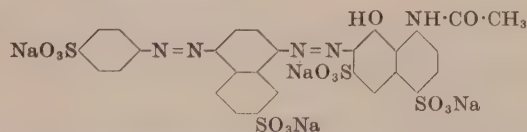
Soluble in water (red)
 Slightly soluble in ethanol (magenta red)
 H_2SO_4 conc. — blue; on dilution — red
 Aqueous solution + HCl conc. — red;
 + NaOH conc. — violet

28430 Acid Dye (Bluish green)

5-Acetamido-2-aminobenzenesulfonic acid
 \rightarrow 5-Amino-6-ethoxy-2-naphthalenesulfonic acid
 (sod. carb.) \rightarrow N-Acetyl S acid

Discoverer — E. Fellmer 1924
Foulard Discharge Green BL (By)
 Applied to natural silk from a Glauber's salt-acetic acid dyebath it is of good fastness to light and washing and is dischargeable to white
 I.G., USP 1699427; GP 431265 (Fr. 15, 528)
 FIAT 764 — Foulardaetzgruen BL

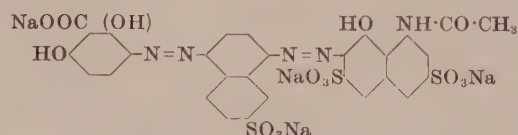
Moderately soluble in water and ethanol (bluish green)
 H_2SO_4 conc. — greyish blue; on dilution — blue
 Aqueous solution + HCl conc. — greenish blue;
 + NaOH conc. — dullish violet

28440 C.I. Food Black 1

Sulfanilic acid \rightarrow 1,7-Cleve's acid \rightarrow N-Acetyl K acid

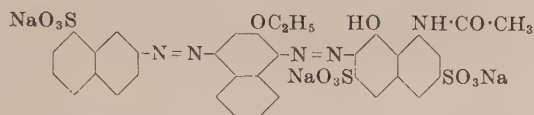
Standard
 B.S. 4354 (1968) Metric units. Black PN for use in foodstuffs.

Soluble in water (bluish violet)
 Slightly soluble in ethanol (reddish blue)
 H_2SO_4 conc. — turquoise blue; on dilution — reddish blue
 Aqueous solution + HCl conc. — navy blue;
 + NaOH conc. — bluish violet

28450 Mordant Dye

3(and 5)-Aminosalicilic acid \rightarrow 1,7-Cleve's acid \rightarrow N-Acetyl H acid

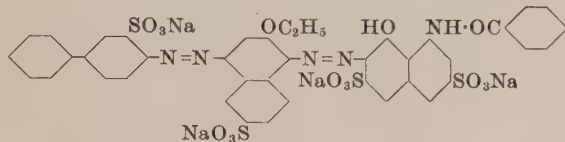
Discoverer — Bayer Co.
Chrome Green YD (By)

28455 Direct Dye

7-Amino-1-naphthalenesulfonic acid
 → 2-Ethoxy-1-naphthylamine → *N*-Acetyl H acid

Discoverer — L. Hauck (I.G.) 1928
Brilliant Benzo Fast Green BL (IG)

Soluble in water (deep green)
 Very slightly soluble in ethanol (pale bluish green)
 H₂SO₄ conc. — violet black to brownish black; on dilution — bluish green
 Aqueous solution + HCl conc. — bluish green;
 + NaOH conc. — dullish violet ppt.

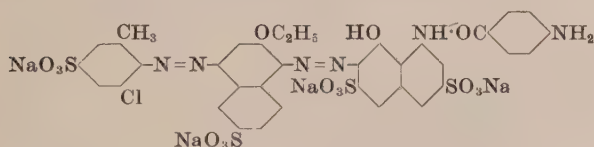
28470 C.I. Direct Green 13 (Green)

4-Amino-3-biphenylsulfonic acid
 → 5-Amino-6-ethoxy-2-naphthalenesulfonic acid
 → *N*-Benzoyl H acid

Carry out the final coupling in aqueous pyridine

Discoverers — H. Clingstein, W. Petzold and L. Hauck 1934
 I.G., BP 443841; USP 2061551; FP 793202; GP 644725
 (Fr. 23, 799)
 BIOS 1548, 184
 FIAT 764 — Brillantbenzoechtgruen GL

Soluble in water (bluish green)
 Very slightly soluble in ethanol
 H₂SO₄ conc. — greyish black; on dilution — bluish green
 Aqueous solution + HCl conc. — olive green ppt;
 + NaOH conc. — violet grey black ppt.

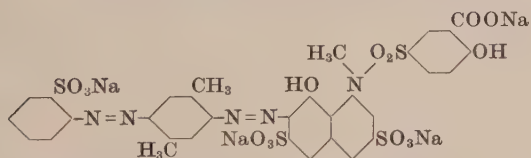
28480 C.I. Direct Green 49 (Yellowish green)*

4-Amino-5-chloro-*m*-toluenesulfonic acid
 → 5-Amino-6-ethoxy-2-naphthalenesulfonic acid
 (sod. bicarb. and pyridine) → *N*-*p*-Aminobenzoyl H acid

* Developed with methylphenylpyrazolone

Discoverer — Delft 1916
 Agfa, GP 288278 (Fr. 12, 350)
 FIAT 764 — Diazobrillantgruen 6G

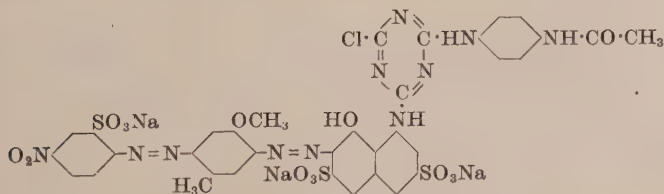
Soluble in water (greenish blue)
 Very slightly soluble in ethanol
 H₂SO₄ conc. — olive green; on dilution — reddish violet
 Aqueous solution + HCl conc. — bluish red ppt;
 + NaOH conc. — corinth ppt.

28490 C.I. Mordant Violet 12 (Violet)

o-Aminobenzenesulfonic acid → 2,5-Xylidine
 → 5-[(8-Hydroxy-3,6-disulfo-1-naphthyl)methylsulfamoyl]salicylic acid

Discoverers — W. Neelmeier and T. Nocken 1924
 I.G. BP 229330; USP 1602776; FP 592954; GP 416617 (Fr. 15, 482)

Soluble in water (reddish violet)
 Slightly soluble in ethanol (reddish violet)
 H₂SO₄ conc. — turquoise; on dilution — reddish violet
 Aqueous solution + HCl conc. — reddish violet;
 + NaOH conc. — violet

28500 Direct Dye

2-Amino-5-nitrobenzenesulfonic acid → Cresidine → E

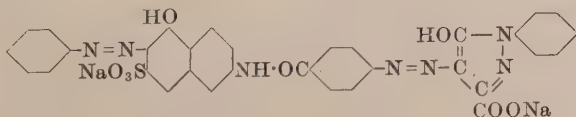
Condense cyanuric chloride with H acid (1 mol.) and p-aminoacetanilide (1 mol.) to obtain coupling component E

Discoverers — H. Fritzsche, E. Krummenacher, H. Gubler and O. Kaiser 1923

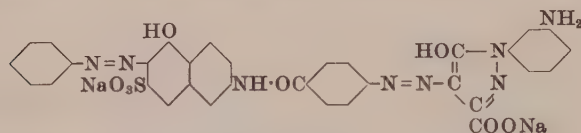
Chlorantine Fast Blue 8G (Ciba)
 Ciba, BP 209723; USP 1667312; FP 576725; Sw.P 109481
 and additions; GP 436179 (Fr. 15, 531)
 Fierz-David and Matter, JSDC, 53 (1937), 432

Discoverer — H. Roos 1935
 I.G., BP 458039; USP 2200040; FP 798386; GP 663550
 (Fr. 25, 682)
 FIAT 764 — Pyraminorange RF

Moderately soluble in water (brownish orange) and in ethanol
 H₂SO₄ conc. — orange red; on dilution — orange
 Aqueous solution + HCl conc. — brownish orange ppt;
 + NaOH conc. — orange brown

28650 C.I. Direct Orange 5 (Bright orange)

Aniline → *N*-*p*-Aminobenzoyl J acid
 → 3-Carboxy-1-phenyl-5-pyrazolone

28660 C.I. Direct Orange 90 (Bright orange)*

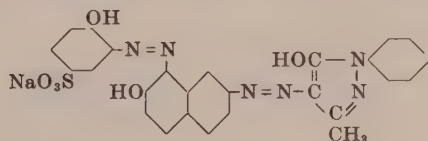
Aniline \rightarrow *N*-*p*-Aminobenzoyl J acid
 \rightarrow 3-Carboxy-1-*m*-nitrophenyl-5-pyrazolone
 then reduce the nitro group to an amino group

* Developed with 2-naphthol

Discoverer — H. Roos 1936

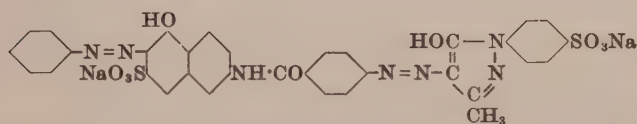
I.G., BP 445266; USP 2136757; FP 791671; GP 631184
 (Fr. 23, 1179); GP 223543 (Fr. 10, 911)
 FIAT 764 — Diazobrillantorange GRN ex.

Soluble in water (brownish orange)
 Very slightly soluble in ethanol (orange)
 H₂SO₄ conc. — red; on dilution — pale orange
 Aqueous solution + HCl conc. — reddish orange, ppt;
 + NaOH conc. — orange brown.

28670 C.I. Mordant Brown 65 (Reddish brown)

2-Amino-1-phenol-4-sulfonic acid \rightarrow 7-Amino-2-naphthol
 \rightarrow 3-Methyl-1-phenyl-5-pyrazolone

Soluble in water (brownish red)
 H₂SO₄ conc. — bluish red
 NaOH dil. — orange brown solution
 Aqueous solution + HCl conc. — brownish red ppt.

28680 Direct Dye

Aniline \rightarrow *N*-*p*-Aminobenzoyl J acid
 \rightarrow 3-Methyl-1-(*p*-sulfophenyl)-5-pyrazolone

Discoverer — C. O. Müller 1907

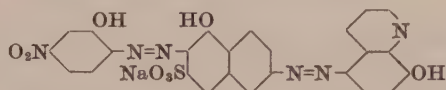
Dianil Fast Orange O (MLB)

Fastness Properties (C): Acid (organic) 5, Alkali 4,
 Light 2, 2, 2, Washing 2, Water 2

Dischargeability: fairly good

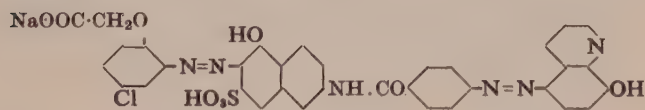
M.L.B., GP 205665 (Fr. 9, 397)

Soluble in water (orange)
 Moderately soluble in ethanol (golden orange)
 H₂SO₄ conc. — red; on dilution — golden orange
 Aqueous solution + HCl conc. — orange;
 + NaOH conc. — brownish orange

28685 C.I. Direct Black 104 (Reddish grey)*

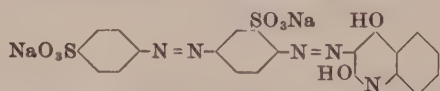
2-Amino-5-nitrophenol \rightarrow J acid \rightarrow 8-Quinolinol

*Aftercoppered

28686 C.I. Direct Red 174 (Yellowish red)

2-Amino-4-chlorophenoxyacetic acid
 \rightarrow *N*-*p*-Aminobenzoyl J acid \rightarrow 8-Quinolinol

Panchartek, Allan and Mužlk, Coll. Czech. Chem. Commun.,
 25 (1960) 2783-2799

28690 C.I. Acid Orange 4 (Yellowish orange)

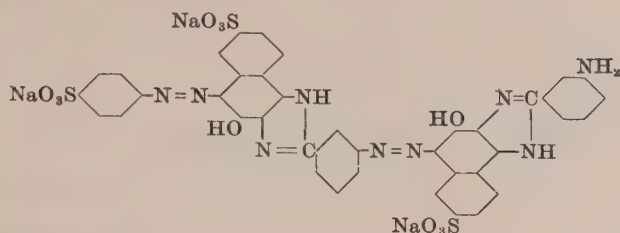
6-Amino-3,4'-azodibenzenesulfonic acid \rightarrow 2,4-Quinolinediol

Primazine Orange G (IG)

BIOS 961, 55

FIAT 764 — Primazinorange G

28700 Direct Dye



Sulfanilic acid

→ 2-(*m*-Aminophenyl)-4-hydroxy-1*H*-naphth[1,2]-imidazole-7-sulfonic acid*
→ 2-(*m*-Aminophenyl)-4-hydroxy-1*H*-naphth[1,2]-imidazole-7-sulfonic acid

* Made by condensing *m*-aminobenzaldehyde with 3,4-diamino-2-naphthol-7-sulfonic acid, which is obtained by reduction of the azo dye made by coupling a diazotised arylamine to 3-amino-2-naphthol-7-sulfonic acid

Discoverer — G. Kalischer 1910

Diamine Azo Orange RR (C)

Developed with 2-naphthol the dischargeability is poor

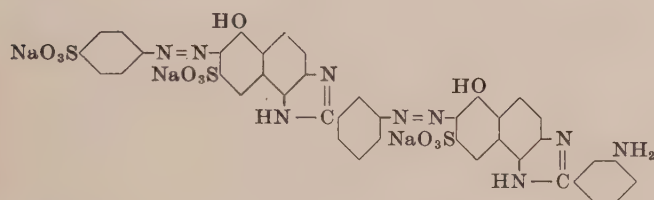
Cassella Co., *BP* 15646/10; *USP* 999230; *FP* 428447 *GP* 233939 (*Fr.* 10, 916)

Soluble in water (orange)

H₂SO₄ conc. — scarlet; on dilution — yellowish brown gelatinous ppt.

Aqueous solution + HCl — yellowish brown gelatinous ppt;
+ NaOH conc. — deeper orange solution and ppt.

28705 Direct Dye



Sulfanilic acid

→ 2-(*m*-Aminophenyl)-6-hydroxy-1*H*-naphth[1,2]-imidazole-8-sulfonic acid*
→ 2-(*m*-Aminophenyl)-6-hydroxy-1*H*-naphth[1,2]-imidazole-8-sulfonic acid

* Made by a synthesis like that under C.I.28700, with *J* acid replacing 3-amino-2-naphthol-7-sulfonic acid

Discoverer — R. Schüle 1908

Diamine Azo Scarlets (C). A series of dyes obtained by using various amines as diazo components, e.g. sulfanilic acid (Compare C.I. 1st edition No. 322)

Cassella Co., *USP* 912182; *FP* 396100; *GP* 209110 (*Fr.* 9, 405)

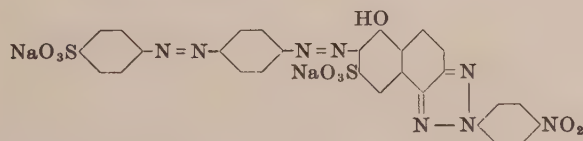
Reactions of Diamine Azo Scarlets:

Soluble in water (2 **BL extra**, reddish brown), (6 **BL extra**, bluish red), (8 **B extra**, red)

H₂SO₄ conc. — 2 **BL extra**, magenta red; on dilution — reddish brown ppt; 6 **BL extra**, violet; on dilution — bluish red ppt; 8 **B extra**, red; on dilution — red ppt.

Aqueous solution + HCl — 2 **BL extra**, red ppt; 6 **BL extra**, bluish red ppt; 8 **B extra**, red ppt;
+ NaOH — 2 **BL extra**, dark brown; 6 **BL extra**, dark brownish red; 8 **B extra**, dark bluish red

28710 Leather Dye



p-Nitroaniline → (*acid*) *J* acid;

then treat with copper sulfate and ammonia to oxidise to

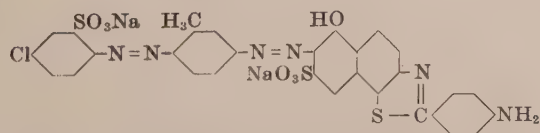
6-Hydroxy-2-(*p*-nitrophenyl)-2*H*-naphtho[1,2]triazole-8-sulfonic acid

After isolation use the product as coupling component (*E*) in *p*-(*p*-Aminophenylazo)benzenesulfonic acid → *E*

Igenal Brown CRB (IG)

FIAT 764 — Igenalbraun CRB

28720 C.I. Direct Violet 78 (Reddish violet)*



2-Amino-5-chlorobenzenesulfonic acid → *m*-Toluidine

→ 2-(*p*-Aminophenyl)-6-hydroxy-2*H*-naphtho[1,2]thiazole-8-sulfonic acid

* Developed with 2-naphthol

Discoverers — O. Günther, L. Hesse and A. Zart 1908

Bayer Co., *BP* 4767/09; *USP* 933446-7-8, 933562; *FP* 402120; *GP* 237742 (*Fr.* 10, 901)

FIAT 764 — Diazolichtviolett 3RL

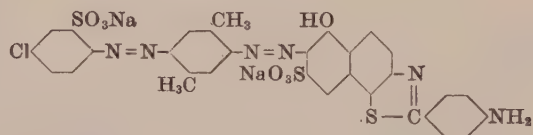
Moderately soluble in water (bordeaux)

Soluble in ethanol (magenta)

H₂SO₄ conc. — blue; on dilution — reddish brown

Aqueous solution + HCl conc. — reddish brown ppt;
+ NaOH conc. — corinth ppt.

28725 C.I. Direct Violet 77 (Bluish violet)*



2-Amino-5-chlorobenzenesulfonic acid \rightarrow 2,5-Xylydine
 \rightarrow 2-(*p*-Aminophenyl)-6-hydroxynaphtho[2,1]thiazole-8-sulfonic acid

* Developed with 2-naphthol

Discoverers — O. Günther, L. Hesse and A. Zart 1908

Bayer Co., *BP* 4767/09; *USP* 933446-7-8, 933562; *FP* 402120;

GP 237742 (*Fr.* 10, 901)

FIAT 764 — Diazolichtviolett BL

Moderately soluble in water (bordeaux)

Soluble in ethanol (reddish violet)

H₂SO₄ conc. — greenish blue; on dilution — reddish brown

Aqueous solution + HCl conc. — corinth, ppt;

+ NaOH conc. — violet ppt.

NOTES

DISAZO DYES — IV

DYES OF GENERAL FORMULA: $A \rightarrow Z \cdot X \cdot Z \leftarrow A'$

The majority of dyes in this sub-group are formed by treating an aminoazo compound with phosgene or by treating an aminonaphthol with phosgene and subsequently using the product as a twice coupling component. The dyes are typically Direct dyes of bright orange to red hues except for certain copper complex dyes which are bordeaux to violet or brown.

The dyes are arranged in a sequence based primarily on the twice coupled binuclear component ($Z \cdot X \cdot Z$).

The dyes fall into the following divisions —

| <i>C.I. Numbers</i> | <i>Nature of $Z \cdot X \cdot Z$ Component</i> | <i>Typical Application Classes</i> | <i>Number of Dyes Contained</i> |
|---------------------|---|--|---------------------------------|
| 29000–29090 | Diphenylurea residue resulting from phosgenation of simple aminoazo compounds | | 15 |
| 29100–29130 | 6,6'-Iminobis-1-naphthol-3-sulfonic acid (Di-J acid) | | 8 |
| 29150–29232 | 6,6'-Ureylenebis-1-naphthol-3-sulfonic acid (Carbonyl-J acid, J acid urea) | All Direct with the exception of one Acid dye used for the dyeing of leather | 22 |
| 29250–29275 | Bis ureas or amides derived from diamines | | 5 |
| 29290–29295 | Diphenylurea residue resulting from phosgenation of aminophenylpyrazolone azo dye | | 2 |
| | | TOTAL | 52 |

29000 C.I. Direct Yellow 44 (Bright yellow)

Discoverer — H. Clingstein (I.G.) 1938
FIAT 764 — Siriusgelb GC

Probably a mixture of



together with the two possible symmetrical ureas

Phosgenate an equimolecular mixture of Base A and Base B

Base A: Metanilic acid \rightarrow *o*-Anisidinomethanesulfonic acid and hydrolyse the methanesulfonic acid group. To prepare the coupling component treat *o*-anisidine with formaldehyde and sodium bisulfite

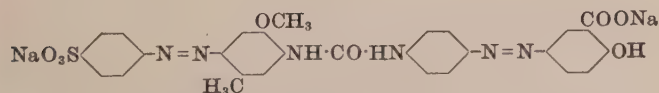
Base B: *p*-Nitroaniline \rightarrow Salicylic acid and reduce the nitro group (Compare C.I.25300)

Soluble in water (greenish yellow)
Slightly soluble in ethanol
 H_2SO_4 conc. — red; on dilution — pale violet
Aqueous solution + HCl conc. — corinth, ppt;
+ NaOH conc. — brownish orange, ppt.

29005 C.I. Direct Yellow 41 (Bright reddish yellow)

Discoverer — E. Messmer 1936
FIAT 764 — Siriuslichtgelb RK

Probably a mixture of



together with the two possible symmetrical ureas

Phosgenate an equimolecular mixture of Base A and Base B

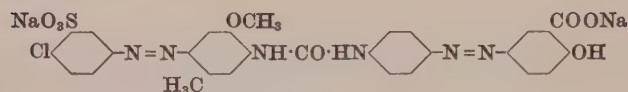
Base A: Sulfanilic acid \rightarrow Cresidine

Base B: *p*-Nitroaniline \rightarrow Salicylic acid and reduce the nitro group (Compare C.I.25300)

Soluble in water (golden yellow)
Slightly soluble in ethanol
 H_2SO_4 conc. — bluish red; on dilution — paler, brown ppt.
Aqueous solution + HCl conc. — corinth ppt;
+ NaOH conc. — golden orange ppt.

29010 C.I. Direct Yellow 42 (Reddish yellow)

Probably a mixture of



together with the two possible symmetrical ureas

Phosgenate an equimolecular mixture of Base A and Base B

Base A: 6-Chlorometanilic acid → Cresidine

Base B: *p*-Nitroaniline → Salicylic acid and reduce the nitro group
(Compare C.I.25300)

Soluble in water and ethanol (yellow)

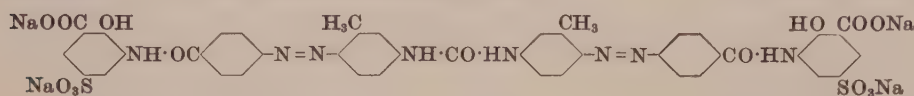
H₂SO₄ conc. — bordeaux; on dilution — paler, brown ppt.

Aqueous solution + HCl conc. — dull violet ppt;

+ NaOH conc. — yellow

29020 C.I. Direct Yellow 33 (Reddish yellow)

Discoverers — H. Winkeler and A. Petz 1937



I.G., BP 491496; USP 2257877; FP 842185; GP 724832 (Fr.-Bayer, I-1, 1189)

BIOS Misc. 20, Appendix 14, 56
FIAT 764 — Siriuslichtgelb FRRL

Phosgenate

3-(*p*-Aminobenzamido)-5-sulfosalicylic acid → *m*-Toluidine

Soluble in water (golden yellow)

Insoluble in ethanol

H₂SO₄ conc. — magenta red; on dilution — greyish violet

Aqueous solution + HCl conc. — violet black ppt;

+ NaOH conc. — golden orange

29025 C.I. Direct Yellow 50 (Bright reddish yellow)

Discoverers — O. Günther and L. Hesse 1908



Bayer Co., BP 5383/09; USP 935016-7-8; FP 402030; GP 216666 (Fr. 9, 372)

BIOS 1548, 120; FIAT 764 — Siriuslichtgelb R ex.

Phosgenate

3-Amino-1,5-naphthalenedisulfonic acid → *m*-Toluidine

Soluble in water (golden yellow)

Slightly soluble in ethanol

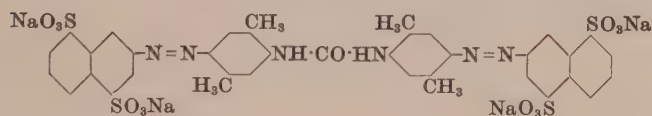
Insoluble in other organic solvents

H₂SO₄ conc. — magenta red; on dilution — greenish blue (blue ppt.)

HNO₃ conc. — violet solution

Aqueous solution + HCl conc. — violet ppt;

+ NaOH conc. — golden orange ppt.

29030 C.I. Direct Yellow 51 (Yellow)

Phosgenate

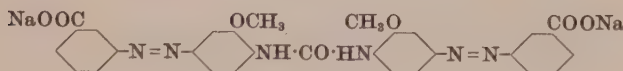
3-Amino-1,5-naphthalenedisulfonic acid → 2,5-Xylidine

Soluble in water (yellow)

H₂SO₄ conc. — dark red; on dilution — bluish black ppt.

29035 C.I. Direct Yellow 49 (Bright yellow)

Discoverers — O. Günther and L. Hesse 1908



Bayer Co., BP 5383/09; USP 935016-7-8; FP 402030; GP 216666 (Fr. 9, 372)

FIAT 764 — Siriusgelb G

m-Aminobenzoic acid → *o*-Anisidinomethanesulfonic acid;
hydrolyse the methanesulfonic acid group, then phosgenate

Soluble in water (greenish yellow)

Moderately soluble in ethanol

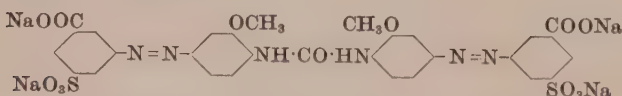
H₂SO₄ conc. — magenta to reddish violet; on dilution — weak yellowish olive

Aqueous solution + HCl conc. — dark brown ppt;

+ NaOH conc. — hue unchanged, ppt.

29045 Direct Dye

Discoverers — W. Neelmeier and R. Fischer 1923



Chrom Soga Puré Yellow 29717 (By)

Gives bright greenish yellow on cotton applied by the Batik process as developed in Indonesia. Applied as a direct dye and aftertreated with chromium fluoride is fast to boiling water

Bayer Co., GP 408294 (Fr. 14, 1091), BP 293810; GP 508837 (Fr. 17, 1047)

3-Amino-5-sulfobenzoic acid
→ *o*-Anisidinomethanesulfonic acid;
hydrolyse the methanesulfonic acid group, then phosgenate

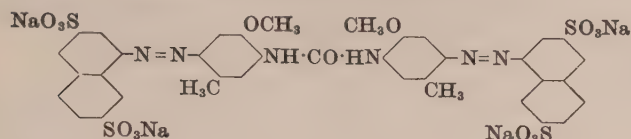
Soluble in water (yellow)

Slightly soluble in ethanol (yellow)

H₂SO₄ conc. — violet; on dilution — weak reddish brown

Aqueous solution + HCl conc. — dark brown ppt;

+ NaOH conc. — orange brown

29050 C.I. Direct Orange 49 (Bright orange)*Phosgenate*

4-Amino-2,6-naphthalenedisulfonic acid → Cresidine

Discoverers — O. Günther and A. Hesse 1908

Bayer Co., BP 5383/09; USP 935016-7-8; FP 402030; GP 216666

(Fr. 9, 372)

FIAT 764 — Siriusorange G

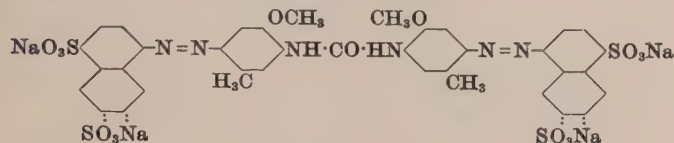
Soluble in water (yellowish orange)

Slightly soluble in ethanol

H₂SO₄ conc. — deep blue; on dilution — bluish green

Aqueous solution + HCl conc. — dull bluish green ppt;

+ NaOH conc. — yellowish orange ppt.

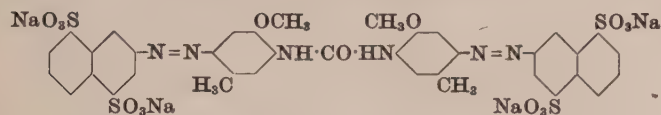
29055 C.I. Direct Orange 69 (Orange)*Phosgenate*

4-Amino-1,6(and 1,7)-naphthalenedisulfonic acid → Cresidine

Soluble in water (orange yellow)

H₂SO₄ conc. — blue; on dilution — greenish blue ppt.

+ NaOH conc. — orange yellow ppt.

29060 C.I. Direct Yellow 34 (Reddish yellow)*Phosgenate*

3-Amino-1,5-naphthalenedisulfonic acid → Cresidine

Discoverer — K. Wöhler 1949; L. Richter 1950

FW., East German P 7492

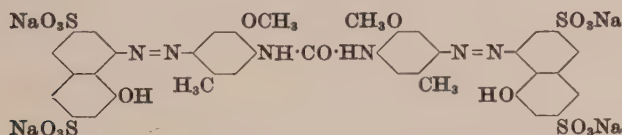
Gen. Aniline & Film Corp., USP 2666757

Soluble in water (orange)

H₂SO₄ conc. — blue; on dilution — bluish black ppt.

Aqueous solution + HCl conc. — bluish black ppt;

+ NaOH 10% — yellow ppt.

29065 C.I. Direct Red 79 (Bright bluish red)*Phosgenate**O-p*-Tolylsulfonyl H acid → Cresidine;then hydrolyse the *p*-toluenesulfonic ester groups*Discoverers* — G. de Montmollin, H. Gubler and J. Spieler 1926

Ciba, BP 274130; USP 1846546; FP 636970; Sw.P 123162;

GP 493811 (Fr. 16, 1059)

Nishi, JSDC, 57 (1941), 125

Soluble in water (red to bluish red)

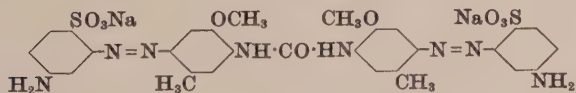
Slightly soluble in Cellosolve

Insoluble in other organic solvents

H₂SO₄ conc. — blue; on dilution — violetHNO₃ conc. — blue black solution, turns blue, then olive

Aqueous solution + HCl conc. — bluish green ppt;

+ NaOH conc. — yellowish orange

29080 C.I. Direct Yellow 67 (Yellow)**Phosgenate*

2-Amino-4-formamidobenzenesulfonic acid → Cresidine;

then hydrolyse the formamido groups

Discoverers — H. Schweitzer, A. Zart and O. Günther 1910

Bayer Co., BP 12433/10; USP 999944, 1001183; FP 429823;

GP 234637 (Fr. 10, 863)

FIAT 764 — Paragelb R

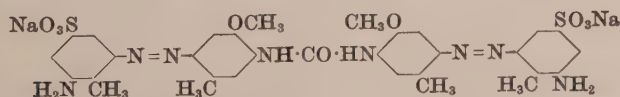
Moderately soluble in water (golden orange)

Slightly soluble in ethanol (yellow)

H₂SO₄ conc. — blue; on dilution — pale brownish grey

Aqueous solution + HCl conc. — dark brown, ppt;

+ NaOH conc. — unchanged

* Coupled with diazotised *p*-nitroaniline**29085 C.I. Direct Brown 126 (Yellowish brown)****Phosgenate*

3'-Amino-2'-methyl-5'-sulfooxanilic acid → Cresidine;

then hydrolyse the oxamic acid groups

Discoverers — A. Zart and H. Schweitzer 1911

Bayer Co., BP 12433/10; USP 999944, 1001183; FP 429823;

GP 234637 (Fr. 10, 863)

FIAT 764 — Diazobraun 3G

Soluble in water (golden yellow)

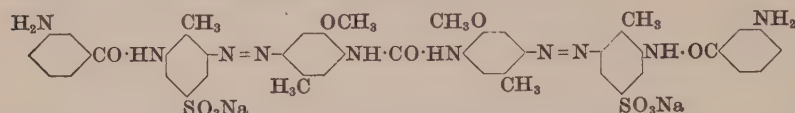
Very soluble in ethanol

H₂SO₄ conc. — deep violet; on dilution — olive yellow

Aqueous solution + HCl conc. — olive yellow to brown ppt;

+ NaOH conc. — greenish to golden yellow

* Developed with toluene-2,4-diamine

29090 C.I. Direct Orange 83 (Yellowish orange)*

Reduce the nitro group in 3-Amino-5-(*m*-nitrobenzamido)-*p*-toluene-sulfonic acid to the sulfaminic acid group by treatment with sodium bisulfite, \rightarrow Cresidine;

then phosgenate and finally hydrolyse the sulfaminic acid group

* Developed with 2-naphthol

Discoverers — H. Schweitzer and A. Zart 1910

Bayer Co., BP 8013/11; USP 1024031; FP 429823;

GP 246668 (Fr. 10, 864)

FIAT 764 — Paragelb GG, Diazobraun 6G

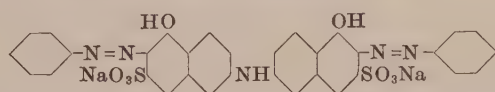
Soluble in water (reddish yellow)

Slightly soluble in ethanol (greenish yellow)

H₂SO₄ conc. — dark violet; on dilution — yellowish olive

Aqueous solution + HCl conc. — dark olive brown, ppt;

+ NaOH conc. — unchanged

29100 C.I. Direct Red 31 (Bright bluish red)

Aniline (2 mol.) \rightarrow 6,6'-Iminobis-1-naphthol-3-sulfonic acid

Aqueous solution + HCl conc. — bordeaux ppt;

NaOH conc. — orange brown

Discoverers — J. Bammann, E. Davidis and W. Vorster 1899

Bayer Co., BP 24296/99; USP 656620, 656621; FP 294921;

GP 114841 (Fr. 6, 953)

BIOS 1548, 138; FIAT 764 — Benzorhodulinrot B

Ruggli & Leupin, *Helv. Chim. Acta*, 22 (1939), 1170

Soluble in water (magenta red) and Cellosolve

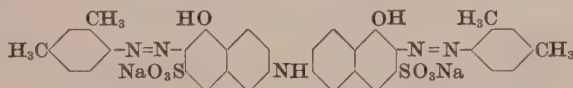
Slightly soluble in ethanol (reddish orange)

Insoluble in other organic solvents

H₂SO₄ conc. — orange to reddish brown; on dilution — dull

bluish red ppt.

HNO₃ conc. — orange brown solution and ppt.

29105 C.I. Direct Violet 14 (Bright reddish violet)

2,4-Xylidine (2 mol.) \rightarrow 6,6'-Iminobis-1-naphthol-3-sulfonic acid

(The 2,4-xylidine may be partially replaced by isomers or other arylamines — see BIOS 1548)

Discoverers — J. Bammann, E. Davidis and W. Vorster 1899

Patents as for C.I.29100

BIOS 1548, 158; FIAT 764 — Benzorhodulinrot 3B

Soluble in water (reddish violet)

Slightly soluble in ethanol (pink) and Cellosolve

H₂SO₄ conc. — reddish violet; on dilution — dullish magenta red

HNO₃ conc. — bright orange (partial solution) becomes duller

Aqueous solution + HCl conc. — reddish violet;

+ NaOH conc. — bordeaux ppt.

29110 C.I. Direct Red 149 (Bordeaux)*

m-Aminoformanilide (2 mol.) \rightarrow 6,6'-Iminobis-1-naphthol-3-sulfonic acid and hydrolyse the formamido group

* Developed with 2-naphthol

Discoverers — J. Bammann, E. Davidis and W. Vorster 1899

Patents as for C.I.29100

FIAT 764 — Diazobordo 7B

Soluble in water and ethanol (bluish red)

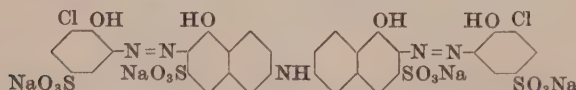
H₂SO₄ conc. — corinth; on dilution — red solution, dark bluish red ppt.

Aqueous solution + HCl conc. — bordeaux ppt;

+ NaOH conc. — orange brown

29115 C.I. Acid Blue 36

Bis Chromium complex of



2-Amino-6-chloro-1-phenol-4-sulfonic acid (2 mol.)

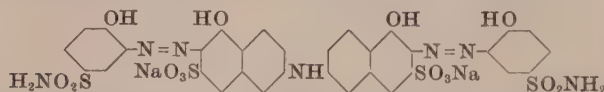
\rightarrow 6,6'-Iminobis-1-naphthol-3-sulfonic acid

and convert to the chromium complex with chromium formate

FIAT 764 — Erganißblau BGC

29120 C.I. Direct Violet 66 (Violet)

Bis Copper complex of



2-Amino-1-phenol-4-sulfonamide (2 mol.)

\rightarrow 6,6'-Iminobis-1-naphthol-3-sulfonic acid

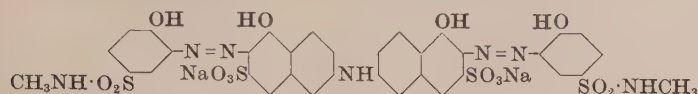
and convert to the bis copper complex

Soluble in water (reddish violet)

H₂SO₄ conc. — blue; on dilution — reddish violet

Aqueous solution + HCl 10% — violet ppt;

+ NaOH 10% — bluish violet

29125 C.I. Direct Violet 48 (Bluish violet)*Bis Copper complex of*

2-Amino-N-methyl-1-phenol-4-sulfonamide (2 mol.)

 \Rightarrow 6,6'-Iminobis-1-naphthol-3-sulfonic acid

and convert to the bis copper complex by treatment with ammoniacal copper sulfate

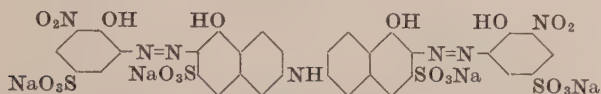
Discoverers — Ciba 1920; H. Krzikalla 1926; W. Hentrich, M. Hardtmann and J. Hilger 1926Ciba, *GP* 369584 (*Fr.* 14, 1001)I.G., *BP* 292660, 296819; *USP* 1765680, 1837266; *FP* 632941, 638772; *GP* 474997 (*Fr.* 16, 968); *GP ap.* I 27916 (*Fr.* 17, 1034)*BIOS* 1548, 130; *FIAT* 764 — Siriuslichtviolett BL

Soluble in water (violet) and ethanol (reddish violet)

Insoluble in other organic solvents

 H_2SO_4 conc. — blackish violet; on dilution — wine redAqueous solution + HCl conc. — bordeaux ppt;+ $NaOH$ conc. — violet ppt.**29128 C.I. Direct Blue 184 (Blue)**

A copper complex derived from



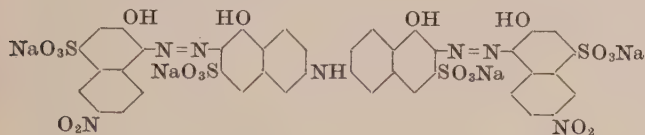
2-Amino-6-nitro-1-phenol-4-sulfonic acid (2 mol.)

 \Rightarrow 6,6'-Iminobis-1-naphthol-3-sulfonic acid;

then convert to the copper complex

29130 C.I. Direct Blue 185 (Blue)

A copper complex derived from



1-Amino-6-nitro-2-naphthol-4-sulfonic acid (2 mol.)

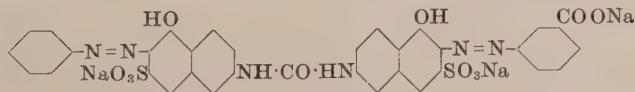
 \Rightarrow 6,6'-Iminobis-1-naphthol-3-sulfonic acid;

then convert to the copper complex

29150 C.I. Direct Orange 26 (Bright reddish orange \rightarrow Bright yellowish red)Aniline (2 mol.) \Rightarrow 6,6'-Ureylenebis-1-naphthol-3-sulfonic acidTo prepare the coupling component phosgenate 6-amino-1-naphthol-3-sulfonic acid (*J acid*)*Discoverers* — W. A. Israel and R. Kothe 1900Bayer Co., *BP* 3615/00; *USP* 622122; *FP* 297367; *GP* 122904, 132511, (*Fr.* 6, 954, 957)Closely related dyes are described in Bayer Co., *BP* 12899/00, 18939/00; *GP* 126133, 126443, 126801, 128195, 129478, 133466, (*Fr.* 6, 956, 210, 961, 962, 211, 958)*BIOS* 1548, 150; *FIAT* 764 — Benzoechtorange SRuggli & Leupin, *Helv. Chim. Acta*, 22 (1939), 1170

Soluble in water (reddish orange brown)

Moderately soluble in ethanol (golden orange)

 H_2SO_4 conc. — bright red; on dilution — reddish orange to red ppt.Aqueous solution + HCl conc. — red ppt; H_2SO_4 10% — redder; $NaOH$ conc. — orange brown; $NaOH$ 10% — slightly yellower**29155 C.I. Direct Orange 29 (Bright reddish orange** \rightarrow Bright yellowish red)Aniline (1) \searrow

6,6'-Ureylenebis-1-naphthol-3-sulfonic acid

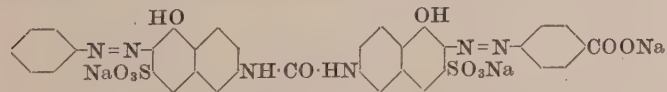
m-Aminobenzoic acid (2) \nearrow *Discoverers* — W. A. Israel and R. Kothe 1899

Patents as for C.I.29150

BIOS 1548, 151; *FIAT* 764 — Benzoechtorange WS

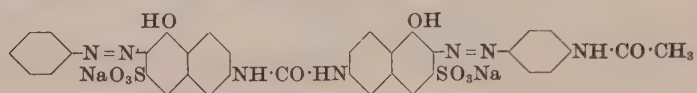
Soluble in water (reddish orange to brown)

Slightly soluble in ethanol (golden orange)

 H_2SO_4 conc. — magenta red; on dilution — orange (reddish ppt.)Aqueous solution + HCl conc. — red ppt; + H_2SO_4 10% — no change; + $NaOH$ conc. — orange brown; + $NaOH$ 10% — duller**29156 C.I. Direct Orange 102 (Reddish orange)**Aniline (1) \searrow

6,6'-Ureylenebis-1-naphthol-3-sulfonic acid

p-Aminobenzoic acid (2) \nearrow *Discoverers* — W. A. Israel and R. Kothe 1899Bayer Co., *BP* 3615/00; *USP* 622122; *FP* 297367; *GP* 122904, 132511 (*Fr.* 6, 954, 957)

29160 C.I. Direct Red 23 (Red)

Aniline \searrow
 \nearrow *p*-Aminoacetanilide \nearrow
 6,6'-Ureylenebis-1-naphthol-3-sulfonic acid
 (For Benzo Fast Scarlet 4BS add the two diazo solutions simultaneously)

Discoverers — W. A. Israel and R. Kothe 1900

Patents as for C.I.29150

BIOS 1548, 155; FIAT 764 — Benzoechtscharlach 4BS

Soluble in water (bright red)

Very slightly soluble in ethanol (orange)

Insoluble in acetone

H₂SO₄ conc. — scarlet to magenta; on dilution — brownish orangeAqueous solution + HCl conc. — wine red ppt; + H₂SO₄ 10% — slightly bluer; + NaOH conc. — reddish orange brown; + Na₂CO₃ 10% — no change**29165 C.I. Direct Red 4 (Bright yellowish red)**

Aniline (a) (alk.) \searrow
 \nearrow Broenner's acid (1) (acid) \nearrow
 6,6'-Ureylenebis-1-naphthol-3-sulfonic acid

Discoverers — W. A. Israel and R. Kothe 1899

Patents as for C.I.29150

FIAT 764 — Benzoechtscharlach GS

Soluble in water (bright red)

Slightly soluble in Cellosolve

Very slightly soluble in ethanol (pale reddish brown)

Insoluble in other organic solvents

H₂SO₄ conc. — violet; on dilution — pink (orange ppt.)

Aqueous solution + HCl conc. — bright red;

NaOH conc. — wine red

29166 C.I. Direct Brown 112 (Reddish brown)

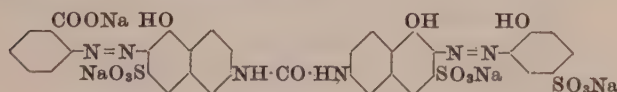
Copper complex derived from



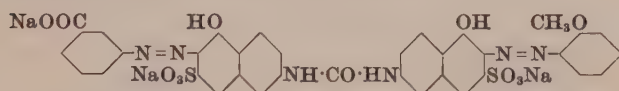
Anthranilic acid (2 mol.) \searrow
 \nearrow 6,6'-Ureylenebis-1-naphthol-3-sulfonic acid

29167 C.I. Direct Red 99 (Bluish red \rightarrow Bordeaux)

A copper complex derived from



Anthranilic acid (1) \searrow
 \nearrow 2-Amino-1-phenol-4-sulfonic acid (2) \nearrow
 6,6'-Ureylenebis-1-naphthol-3-sulfonic acid;
 then convert to the copper complex

29170 C.I. Direct Red 14 (Bright red)

m-Aminobenzoic acid (1) (acid) \searrow
 \nearrow *o*-Anisidine (2) (alk.) \nearrow
 6,6'-Ureylenebis-1-naphthol-3-sulfonic acid

Discoverers — W. A. Israel and R. Kothe 1899

Patents as for C.I.29150

FIAT 764 — Benzoechtscharlach 5BS

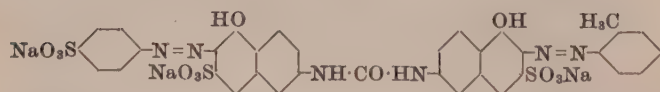
Soluble in water (bright red)

Very slightly soluble in ethanol (weak orange red)

H₂SO₄ conc. — reddish violet; on dilution — magenta red

Aqueous solution + HCl conc. — magenta red ppt;

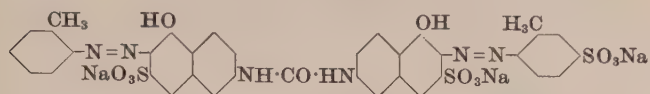
+ NaOH conc. — reddish orange brown ppt.

29173 C.I. Direct Orange 108 (Bright reddish orange)

Sulfanilic acid \searrow
 \nearrow *o*-Toluidine \nearrow
 6,6'-Ureylenebis-1-naphthol-3-sulfonic acid

Discoverers — W. A. Israel and R. Kothe 1899

Bayer Co., BP 3615/00; USP 622122; FP 297367; GP 122904, 132511 (Fr. 6, 954, 957)

29175 C.I. Direct Red 62 (Bright yellowish red)

o-Toluidine (2) (alk.) ↘

6,6'-Ureylenebis-1-naphthol-3-sulfonic acid

4-Amino-*m*-toluenesulfonic acid (1) (acetic acid) ↗

Discoverers — W. A. Israel and R. Kothe 1899

Patents as for C.I.29150

BIOS 1548, 149; FIAT 764 — Benzoechtorange F3R

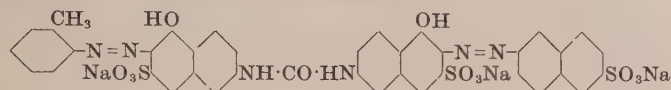
Soluble in water (bright red)

Very slightly soluble in ethanol (pale reddish orange)

H₂SO₄ conc. — magenta red; on dilution — orange

Aqueous solution + HCl conc. — orange brown, ppt;

+ NaOH conc. — reddish orange brown ppt.

29180 C.I. Direct Red 73 (Bright red)

o-Toluidine ↘

6,6'-Ureylenebis-1-naphthol-3-sulfonic acid

Broenner's acid ↗

Discoverers — W. A. Israel and R. Kothe 1899

Patents as for C.I.29150

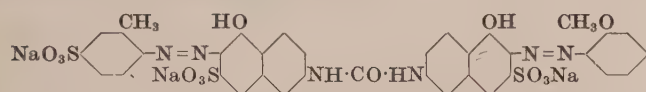
Soluble in water (yellowish red) and Cellosolve

Insoluble in other organic solvents

H₂SO₄ conc. — reddish violet; on dilution — yellowish red

Aqueous solution + H₂SO₄ 10% — no change;

+ NaOH 10% — bluer and duller red

29185 C.I. Direct Red 24 (Red)

4-Amino-*m*-toluenesulfonic acid (1) (acid) ↘

6,6'-Ureylenebis-1-naphthol-3-sulfonic acid

o-Anisidine (2) (alk.) ↗

Discoverers — W. A. Israel and R. Kothe 1899

Patents as for C.I.29150

BIOS 1548, 156; FIAT 764 — Benzoechtscharlach 4BA

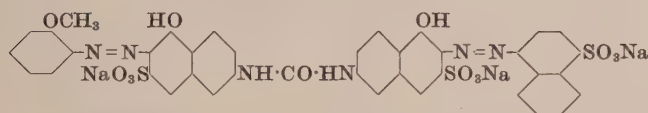
Soluble in water (bright red)

Very slightly soluble in ethanol (pale reddish orange)

H₂SO₄ conc. — reddish violet; on dilution — reddish to orange brown, ppt.

Aqueous solution + HCl conc. — reddish to orange brown;

+ NaOH conc. — orange brown ppt.

29190 C.I. Direct Red 26 (Bluish red)

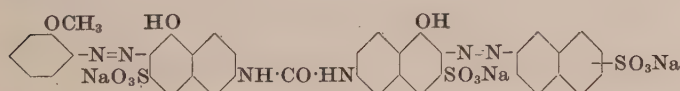
o-Anisidine ↘

6,6'-Ureylenebis-1-naphthol-3-sulfonic acid

Naphthionic acid ↗

Discoverer — Cassella Co. 1903

Patents as for C.I.29150

29195 Direct Dye

o-Anisidine (2) (alk.) ↘

6,6'-Ureylenebis-1-naphthol-3-sulfonic acid

6(and 7)-Amino-2-naphthalenesulfonic acid (1) (acid) ↗

Discoverer — Cassella Co. 1903

Diamine Fast Scarlet 7BS (C)

Fastness Properties (C): Acid (organic) 4, Alkali 4, Light 3, Washing 1, Water 2. Dischargeability, fair

Patents as for C.I.29150

FIAT 764 — Diaminechtscharlach 7BS

Soluble in water (bright red)

Slightly soluble in ethanol (orange red)

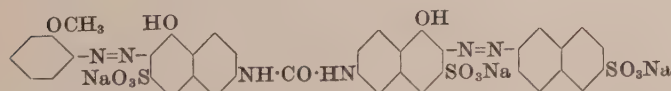
H₂SO₄ conc. — violet; on dilution — magenta red

Aqueous solution + HCl conc. — magenta red;

+ NaOH conc. — red to magenta red

29200 C.I. Direct Red 72 (Bright red)

Mixture produced in situ of C.I.29180 with



[*o*-Anisidine (0.6 mol.)]
[*o*-Toluidine (0.4 mol.)] (2) (alk.) ↘

6,6'-Ureylenebis-1-naphthol-3-sulfonic acid

Broenner's acid (1) (acid) ↗

Discoverers — W. A. Israel and R. Kothe 1899

Patents as for C.I.29150

FIAT 764 — Benzoechtscharlach 4BEN

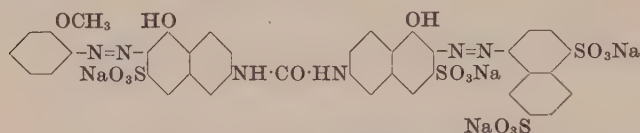
Soluble in water (bright red)

Very slightly soluble in ethanol (pale orange red)

H₂SO₄ conc. — reddish violet; on dilution — reddish to orange brown

Aqueous solution + HCl conc. — orange brown;

+ NaOH conc. — reddish to orange brown

29205 Direct Dye

o-Anisidine (2) (*alk.*)₂
 6,6'-Ureylenebis-1-naphthol-3-sulfonic acid

4-Amino-1,6-naphthalenedisulfonic acid (1) (*acid*)[†]

Discoverers — W. A. Israel and R. Kothe 1899

Benzo Fast Scarlet 8BSN (By)

Fastness Properties (C): Acid (organic) 4, Alkali 5,

Light 2, 3, 3, Washing 1-2, Water 1-2

Dischargeability: fair

Patents as for C.I.29150

FIAT 764 — Benzoechtscharlach 8BSN

Soluble in water (bright red)

Very slightly soluble in ethanol (pale reddish brown)

H₂SO₄ conc. — violet; on dilution — pink

Aqueous solution + HCl conc. — red, ppt;

+ NaOH conc. — wine red

29210 C.I. Direct Red 122 (Red)*

m-Aminoformanilide (2 mol.)

⇒ 6,6'-Ureylenebis-1-naphthol-3-sulfonic acid;

and hydrolyse the formamido groups

* Developed with 2-naphthol

(Note — In **Diazo Brilliant Scarlet 5BL (By)** one mol. of *m*-aminoformanilide was replaced by an *N*²-acetyloluene-2,4-diamine)

Discoverers — W. A. Israel and R. Kothe 1899

Patents as for C.I.29150

FIAT 764 — Diazobrillantscharlach BBL ex. kz

Soluble in water (red)

Slightly soluble in ethanol (weak reddish brown)

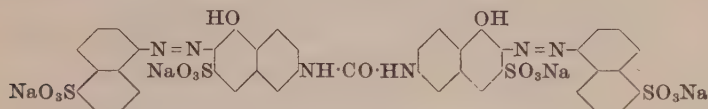
Insoluble in other organic solvents

H₂SO₄ conc. — magenta red; on dilution — golden yellow to orange, orange ppt.

HNO₃ conc. — red brown, turns yellower

Aqueous solution + HCl conc. — brownish orange ppt;

+ NaOH conc. — orange brown

29215 C.I. Direct Red 54 (Bluish red)

5-Amino-1-naphthalenesulfonic acid (2 mol.)

⇒ 6,6'-Ureylenebis-1-naphthol-3-sulfonic acid

Discoverers — W. A. Israel and R. Kothe 1899

Patents as for C.I.29150

FIAT 764 — Benzoechtscharlach 8BA

Soluble in water (magenta red)

Very slightly soluble in ethanol (pale, dull pink)

H₂SO₄ conc. — violet; on dilution — pink

Aqueous solution + HCl conc. — magenta red ppt;

+ NaOH conc. — orange brown

29220 C.I. Direct Red 36 (Bright red)

6-Amino-1-naphthalenesulfonic acid (2 mol.)

⇒ 6,6'-Ureylenebis-1-naphthol-3-sulfonic acid

29225 C.I. Direct Red 83 (Bluish red → Reddish violet)

Bis Copper complex of



4-Methoxymetanilic acid (2 mol.)

⇒ 6,6'-Ureylenebis-1-naphthol-3-sulfonic acid;

and convert to the copper complex with ammoniacal copper sulfate

During the coppering process the two methoxyl groups are replaced by hydroxyl groups*

Discoverers — W. Hentrich and M. Hardtmann 1925

I.G., BP 306859; USP 1690782, 1746651; FP 645219; GP ap. 1 27002 (Fr. 16, 983)

BIOS 1548, 130; FIAT 764 — Siriuslichtrubin BBL

Soluble in water (magenta red)

Very slightly soluble in ethanol (weak violet)

H₂SO₄ conc. — violet black; on dilution — orange to reddish brown

Aqueous solution + HCl conc. — bordeaux to corinth, ppt;

+ NaOH conc. — wine red, ppt.

29230 C.I. Direct Red 98 (Red → Bordeaux)

Bis Copper complex of



2-Amino-1-phenol-4-sulfonamide (2 mol.)

⇒ 6,6'-Ureylenebis-1-naphthol-3-sulfonic acid

and convert to the copper complex

Soluble in water (reddish violet)

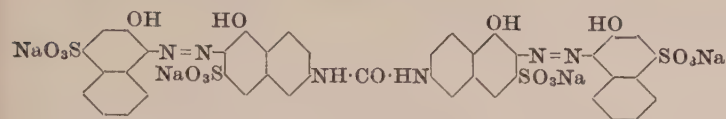
H₂SO₄ conc. — reddish purple; on dilution — paler

Aqueous solution + HCl conc. — reddish violet ppt;

+ NaOH — reddish purple

29232 Direct Dye

A copper complex derived from



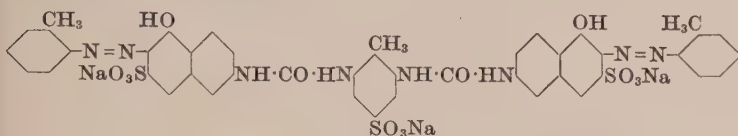
1-Amino-2-naphthol-4-sulfonic acid (2 mol.)
 \Rightarrow 6,6'-Ureylenebis-1-naphthol-3-sulfonic acid;

then convert to the copper complex

Discoverers — W. A. Israel and R. Kothé 1899

Helion Violet 3BL (Pol)

Patents as for C.I. 29173

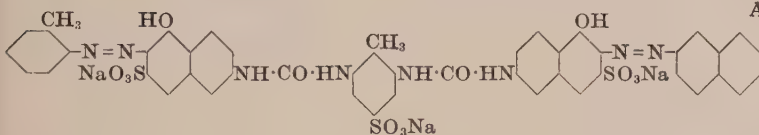
29250 Direct Dye

Phosgenate a mixture of J acid (2 mol.) and 3,5-Diamino-*p*-toluenesulfonic acid (1 mol.); couple the product with diazotised *o*-Toluidine (2 mol.)

Discoverer — H. Freimann 1909

Azidine Fast Scarlet GGS (CJ)Jäger (Düsseldorf), *BP* 1781/10; *USP* 1006929; *FP* 412138; *GP* 236594 (*Fr.* 10, 904)

Soluble in water (orange red) and ethanol (yellowish orange)
 H₂SO₄ conc. — cherry red; on dilution — violet ppt.
 Aqueous solution + HCl — red flocculent ppt;
 + NaOH — unaltered

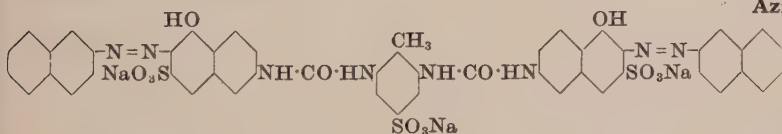
29255 Direct Dye

Phosgenate a mixture of J acid (2 mol.) and 3,5-Diamino-*p*-toluenesulfonic acid (1 mol.); couple the product with diazotised *o*-Toluidine (1 mol.) and diazotised 2-Naphthylamine (1 mol.)

Discoverer — H. Freimann 1909

Azidine Fast Scarlet 4BS (CJ)Jäger (Düsseldorf), *BP* 1781/10; *USP* 1006929; *FP* 412138; *GP* 236594 (*Fr.* 10, 904)

Soluble in water (red) and ethanol (yellowish orange)
 H₂SO₄ conc. — violet; on dilution — violet ppt.
 Aqueous solution + HCl — red flocculent ppt;
 + NaOH — partial ppt.

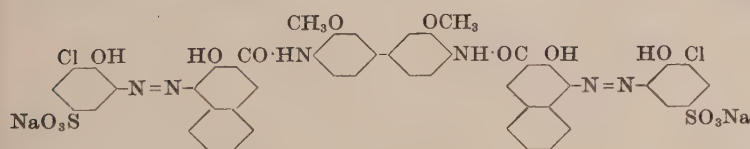
29260 Direct Dye

Phosgenate a mixture of J acid (2 mol.) and 3,5-Diamino-*p*-toluenesulfonic acid (1 mol.); couple the product with diazotised 2-Naphthylamine (2 mol.)

Discoverer — H. Freimann 1909

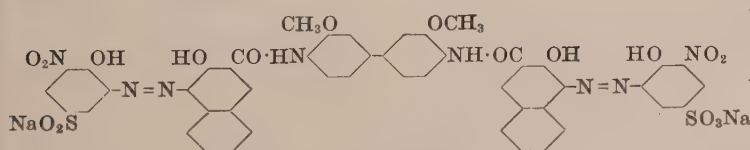
Azidine Fast Scarlet 7BS (CJ)Jäger (Düsseldorf), *BP* 1781/10; *USP* 1006929; *FP* 412138; *GP* 236594 (*Fr.* 10, 904)

Soluble in water (red) and ethanol (yellowish orange)
 H₂SO₄ conc. — violet blue; on dilution — dull violet ppt.
 Aqueous solution + HCl — red flocculent ppt;
 + NaOH — partial ppt.

29270 Direct Dye

2-Amino-6-chloro-1-phenol-4-sulfonic acid (2 mol.)
 \Rightarrow 3,3''-Dihydroxy-4',4'''-bi-2-naphth-*o*-anisidide

Discoverer — I.G.

Benzo Fast Copper Rubine RL (IG) for aftertreatment with copper sulfateI.G., *USP* 2195445; *FP* 842755; *GP* 728886 (*Fr.*-Bayer, I-1, 1221) *BIOS* 1548, 110*BIOS* Misc. 20 Appendix No. 9*FIAT* 764 — Benzoechtkupferrubin RL**29275 Direct Dye**

2-Amino-6-nitro-1-phenol-4-sulfonic acid (2 mol.)
 \Rightarrow 3,3''-Dihydroxy-4',4'''-bi-2-naphth-*o*-anisidide

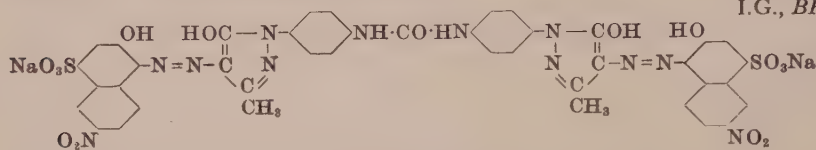
Discoverer — I.G.

Benzo Fast Copper Bordeaux BL (IG) for aftertreatment with copper sulfateI.G., *USP* 2195445; *FP* 842755; *GP* 728886 (*Fr.*-Bayer, I-1, 1221) *BIOS* 1548, 111*BIOS* Misc. 20 Appendix No. 4*FIAT* 764 — Benzoechtkupferbordo BL

29290 C.I. Direct Red 173 (Dull red)*

Discoverer — M. Latten 1929

I.G., BP 348680; USP 1845426; GP 542632 (Fr. 18, 977)
 BIOS 1548, 106; FIAT 764 — Benzoechtkupferrot RL



Phosgenate

1-Amino-6-nitro-2-naphthol-4-sulfonic acid
 → 1-(*p*-Aminophenyl)-3-methyl-5-pyrazolone

Soluble in water (reddish brown)

Moderately soluble in ethanol

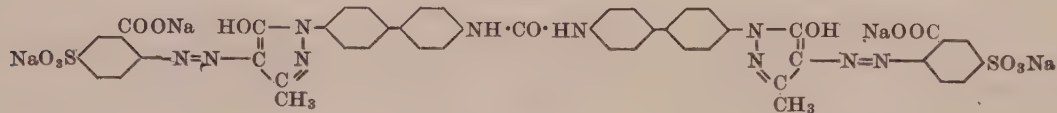
H₂SO₄ conc. — orange red; on dilution — reddish yellow

Aqueous solution + HCl conc. — brownish orange ppt;

+ NaOH conc. — orange brown

* Aftertreated with copper sulfate

29295 C.I. Direct Yellow 70 (Yellow)



Phosgenate

2-amino-5-sulfobenzoic acid → 1-(4'-Amino-4-biphenyl)-3-methyl-5-pyrazolone

Panchartek, Allan and Mužík, *Coll. Czech. Chem. Commun.*,
 25 (1960) 2783-2799

TRISAZO DYES — I

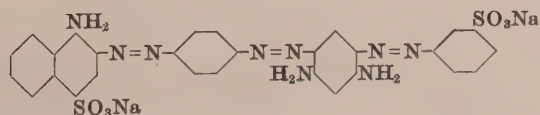
DYES OF GENERAL FORMULA: $D \begin{matrix} \nearrow E \\ \searrow Z \leftarrow A \end{matrix}$

This sub-group and the trisazo and higher polyazo sub-groups which follow consist almost entirely of Direct dyes. There are a few dyes used exclusively for Leather and some of the Direct dyes also have an important use for Leather — the hues are predominantly brown, black or dark shades of blue or green which serve to extend the hue range of the disazo Direct dyes of general formula $D \begin{matrix} \nearrow E \\ \searrow E' \end{matrix}$.

The dyes are arranged in order by taking the components in the sequence tetrazo component (D), twice coupled component (Z), end component (E), diazo component (A). They fall into the following groups —

| C.I. Numbers | Nature of "D" Component | Nature of "Z" Component | Hues | Number of Dyes Contained |
|--------------|---|--|---------------------------------|--------------------------|
| 30000-30030 | <i>p</i> -Phenylenediamine 3,5-Diamino- <i>p</i> -toluenesulfonic acid | <i>m</i> -Phenylenediamine and Toluene-2,4-diamine S acid, K acid | Brown Black | 7 |
| 30035-30130 | Benzidine | <i>m</i> -Phenylenediamine, Toluene-2,4-diamine, 3,5-Diamino- <i>p</i> -toluenesulfonic acid | Brown, blackish blue | 20 |
| 30135-30165 | Benzidine | Resorcinol | Brown | 7 |
| 30170-30180 | Benzidine | Dihydroxynaphthalenesulfonic acid | Black | 3 |
| 30190-30220 | Benzidine | J acid S acid | Bordeaux, blue Green, olive | 7 |
| 30225-30360 | Benzidine | K acid (2 examples) H acid Chicago acid (1 example) | Dull blue, dull green and black | 29 |
| 30365 | 3-Sulfobenzidine | <i>m</i> -Phenylenediamine | Brown | 1 |
| 30370-30390 | <i>o</i> -Tolidine | Various | Dull green, brown and black | 5 |
| 30395-30400 | <i>o</i> -Dianisidine | <i>m</i> -Phenylenediamine J acid | Black | 2 |
| TOTAL | | | | 81 |

30000 Direct Dye (Dull bordeaux)



p-Nitroaniline $\begin{matrix} \nearrow (1) \text{ Naphthionic acid} \\ \searrow (2) \text{ reduce nitro group} \rightarrow (3) [m\text{-Phenylenediamine (acid)} \leftarrow \text{Metanilic acid}] \end{matrix}$

Note — In this and following dyes the coupling of *m*-phenylenediamine has been shown as 4,6 for consistency of illustration although it is believed that the 2,6-coupling is usually equally probable

Discoverer — Kalle Co. 1909

Naphthamine Direct Brown V (K)

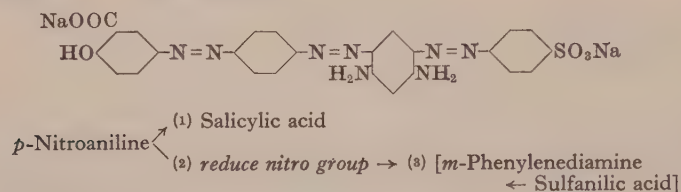
Fastness Properties (C): Acid 2, Alkali 3, Light 1-2, Washing 1, Water 2

Dischargeability, fairly good-good

FIAT 764 — Naphtamindirektbraun V

Soluble in water (reddish brown) and ethanol (red)
H₂SO₄ conc. — greyish green; on dilution — brown
Aqueous solution + HCl conc. — dark brown, ppt; + NaOH conc. — orange brown

30005 Direct Dye

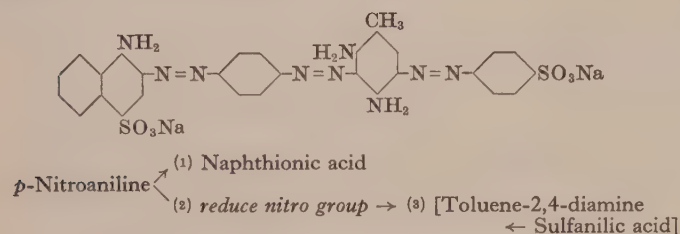


Discoverer — Oehler 1905

Triazol Brown HR (By) may be developed with 2-naphthol or aftertreated with potassium dichromate/copper sulfate

Soluble in water (orange brown); slightly soluble in ethanol
 H_2SO_4 conc. — dull violet; on dilution — yellowish brown
 Aqueous solution + HCl conc. — brown, ppt; + NaOH conc. — reddish brown, ppt.

30010 Direct Dye

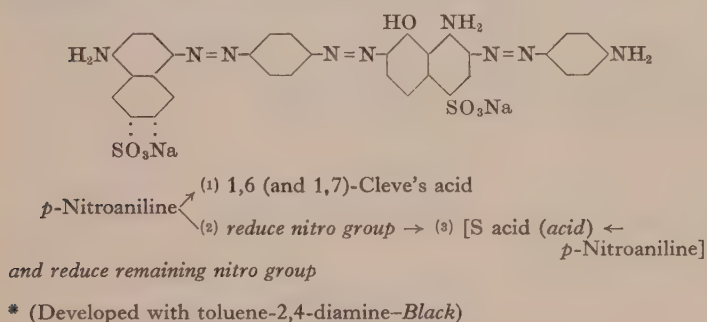


Discoverer — Kalle Co. 1909

Naphthamine Direct Brown RR (K)

Fastness Properties (C): Acid (acetic), fairly good; Alkali, fair;
 Light, poor; Water, very good; Washing, fairly good

30015 C.I. Direct Black 78 (Greenish black)*



Discoverer — Agfa 1902

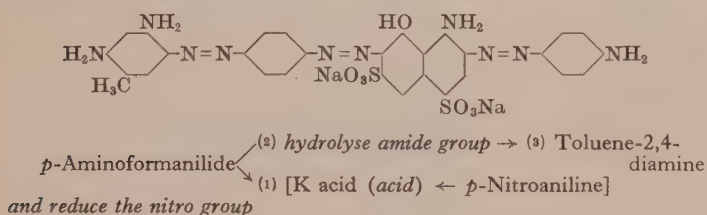
FIAT 764 — Sambesischwarz V

Fierz-David, 163-5

This constitution is given for Zambesi Black V (FIAT 764) but the true constitution is uncertain, cf. Fierz-David where it is stated that at (3) the amino group attached to the naphthalene residue is the one diazotised

Very soluble in water (bluish black)
 Slightly soluble in Cellosolve
 Insoluble in other organic solvents
 H_2SO_4 conc. — blue to bluish black; on dilution — violet ppt;
 HNO_3 conc. — dark reddish brown solution
 Aqueous solution + NaOH conc. — blue solution

30020 Direct Dye

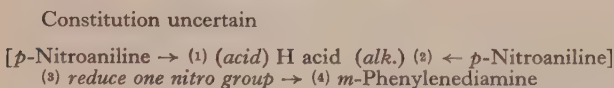


Discoverer — Kalle Co. 1904

Naphthamine Fast Black SE (K) may be developed with 2-naphthol or toluene-2,4-diamine

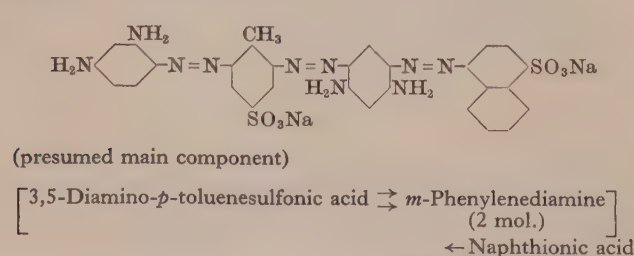
Soluble in water (blue black)
 Slightly soluble in ethanol (weak bluish green)
 H_2SO_4 conc. — bluish grey; on dilution — corinth
 Aqueous solution + HCl conc. — greyish violet ppt; + NaOH conc. — greyish blue ppt.

30025 C.I. Direct Black 13 (Black)



H_2SO_4 conc. — greenish grey; on dilution — violet brown ppt;
 HNO_3 conc. — brown solution
 Aqueous solution + HCl — dark violet solution and ppt;
 + NaOH — unaltered

30030 Direct Dye



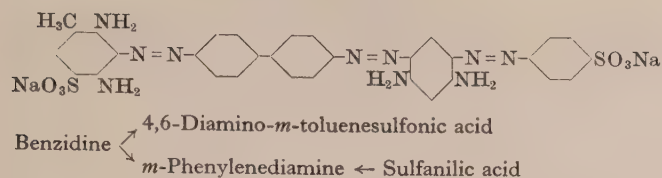
Discoverer — C. Rudolph 1889

Toluylen Brown BM (K) may be developed with 2-naphthol or toluene-2,4-diamine or coupled with diazotised p -nitroaniline

Oehler, BP 11000/89; USP 465116; FP 199658; GP 58657 (Fr. 3, 738)

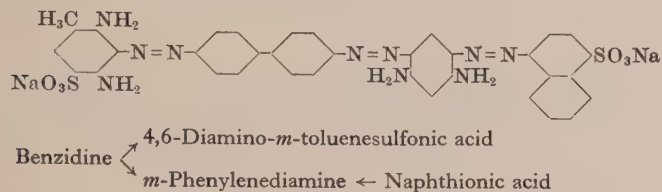
FIAT 764 — Toluylenbraun BM

Soluble in water (brown)
 Very slightly soluble in ethanol
 H_2SO_4 conc. — brown; on dilution — yellowish brown
 Aqueous solution + HCl conc. — brown, ppt; + NaOH conc. — orange brown, ppt.

30035 C.I. Direct Brown 7 (Brown)

Discoverer — Cassella Co. 1900
cf. Bayer Co., *GP* 49139 (*Fr.* 2, 358)
FIAT 764 — Oxydiaminbraun G

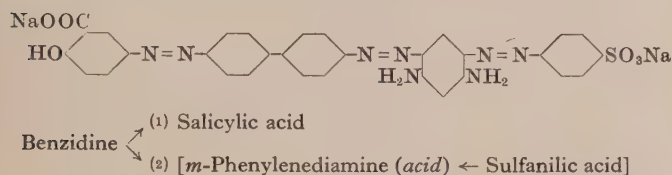
Soluble in water (orange brown) and ethanol (brownish yellow)
 H_2SO_4 conc. — corinth to reddish brown; on dilution — yellowish brown
Aqueous solution + HCl conc. — yellowish olive brown ppt;
+ NaOH conc. — orange brown, ppt.

30040 C.I. Direct Brown 171 (Reddish brown)*

Discoverer — Cassella Co. 1900

Slightly soluble in water (orange brown)
Soluble in ethanol (yellowish brown)
 H_2SO_4 conc. — dull bluish red to brownish violet;
on dilution — yellowish brown ppt.
Aqueous solution + HCl conc. — dark reddish brown ppt;
+ NaOH conc. — orange brown

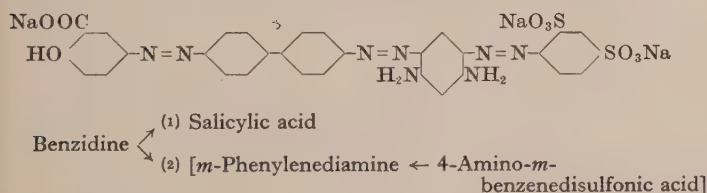
* Coupled with diazotised *p*-nitroaniline

30045 C.I. Direct Brown 1 (Brown)

Discoverer — M.L.B. 1902
cf. Bayer Co., *GP* 49139 (*Fr.* 2, 358)
BIOS 1548, 186
FIAT 764 — Benzobraun D3G ex.
Fierz-David, 194 (structure)
Fierz-David & Blangey, 286

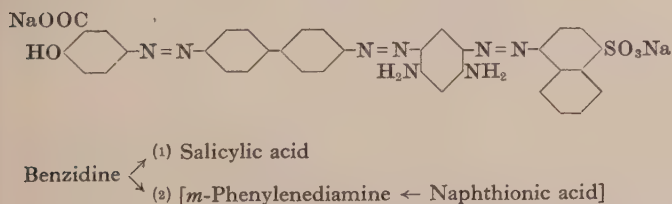
Soluble in water (orange brown) and ethanol
Slightly soluble in acetone and Cellosolve
Insoluble in other organic solvents
 H_2SO_4 conc. — dull reddish violet to violet black; on dilution — brown
 HNO_3 conc. — partially soluble (reddish brown becoming orange brown)

Aqueous solution + NaOH 10% — yellow brown

30050 C.I. Direct Brown 79 (Brown)

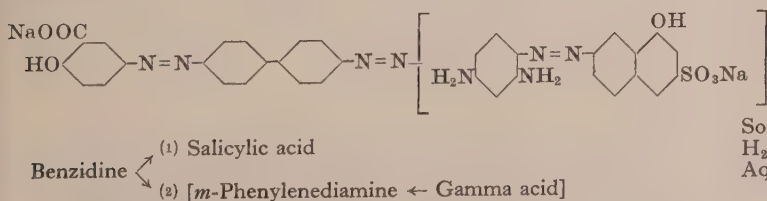
Discoverer — Badische Co. 1909
cf. Bayer Co., *GP* 49139 (*Fr.* 2, 358)
BIOS 1548, 190
FIAT 764 — Oxaminbraun 3G

Very soluble in water (yellowish orange brown)
Very slightly soluble in ethanol
 H_2SO_4 conc. — violet black; on dilution — brown
Aqueous solution + HCl conc. — orange brown ppt;
+ NaOH conc. — orange brown ppt.

30055 C.I. Direct Brown 61 (Reddish brown)

cf. Bayer Co., *GP* 49139 (*Fr.* 2, 358)

Soluble in water (dark orange brown)
 H_2SO_4 conc. — violet; on dilution — brown ppt.
Aqueous solution + HCl — dark brown ppt;
+ NaOH — redder and slight ppt.

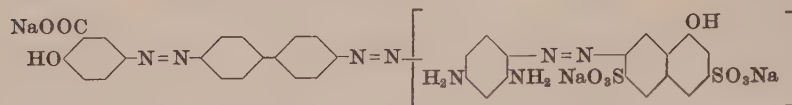
30060 C.I. Direct Brown 20 (Dull reddish brown)

Discoverer — Griesheim-Elektron 1912

Soluble in water (reddish brown)
 H_2SO_4 conc. — reddish blue; on dilution — yellowish brown
Aqueous solution + HCl conc. — dark brown ppt;
+ NaOH — yellowish brown solution, then reddish brown ppt.

30065**Direct Dye (Reddish brown)**

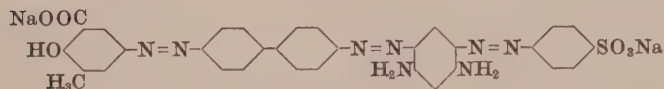
Discoverer — Agfa 1913

Columbia Catechine R (A)

Fastness Properties (C): Acid (organic), fairly good; Alkali, good; Light, poor-fair; Washing, poor-fair; Water, fair

Dischargeability: neutral, fairly good; alkaline, fair
FIAT 764 — Columbiakatechin R "F"

Benzidine $\begin{cases} (1) \text{ Salicylic acid} \\ (2) [m\text{-Phenylenediamine} \leftarrow 2R \text{ acid}] \end{cases}$

30070**C.I. Direct Brown 158 (Brown)**

Benzidine $\begin{cases} 2,3\text{-Cresotic acid} \\ m\text{-Phenylenediamine} \leftarrow \text{Sulfanilic acid} \end{cases}$

Soluble in water (orange brown)

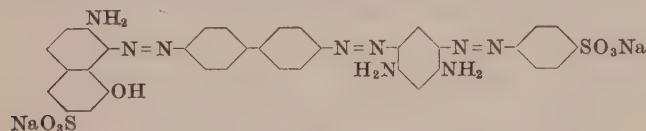
 H_2SO_4 conc. — reddish violet; on dilution — orange yellow

Aqueous solution + HCl conc. — brown ppt;

+ NaOH — reddish brown solution to orange brown ppt.

30075**Direct Dye (Dull reddish brown)**

Discoverer — Agfa 1891

Benzo Brown RC (A)

Benzidine $\begin{cases} (1) \text{ (acid) Gamma acid} \\ (2) [m\text{-Phenylenediamine} \leftarrow \text{Sulfanilic acid}] \end{cases}$

Fastness Properties (C): On Cotton, Acid (organic), fairly good; Alkali, very good; Light, fair; Washing, poor-fair; Water, fairly good. **Eukanol Brilliant Brown R (IG)**, the ammonium salt, formerly used for shading pigmented finishes on leather

FIAT 764 — Eukanolbrillantbraun R

Soluble in water (reddish brown) and ethanol

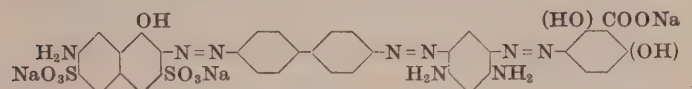
 H_2SO_4 conc. — dullish blue; on dilution — reddish brown

Aqueous solution + HCl conc. — brown ppt;

+ NaOH conc. — orange brown ppt.

30080**Direct Dye**

Discoverer — M. Herzberg 1892

Direct Fast Brown B (By)

Benzidine $\begin{cases} (1) 2R \text{ acid} \\ (2) [m\text{-Phenylenediamine} \leftarrow 3 \text{ (and 5)-} \\ \text{Aminosalicylic acid}] \end{cases}$

Fastness Properties (C): Acid (organic), fairly good; Alkali, very good; Light, fair; Washing, poor-fair; Water, fair

Bayer Co., BP 558/93; FP 229435; GP 75293 (Fr. 3, 632)

Soluble in water (reddish brown); very slightly soluble in ethanol

 H_2SO_4 conc. — blue black; on dilution — corinth

Aqueous solution + HCl conc. — corinth ppt;

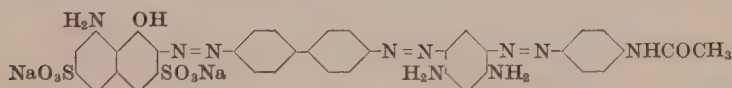
+ NaOH conc. — reddish brown

30085**Direct Dye**

Discoverers — A. Blank, W. A. Israel, and M. Herzberg 1893

Diazo Brown V (By) may be developed with 2-naphthol to give violet tinted grey brown

Bayer Co., BP 7330/93; USP 561694, 561709; FP 229976; GP 97437 (Fr. 5, 583)



Benzidine $\begin{cases} (1) \text{ (alk.) H acid} \\ (2) [m\text{-Phenylenediamine} \leftarrow p\text{-Aminoacetanilide}] \end{cases}$

Soluble in water (violet black) and ethanol (orange brown)

 H_2SO_4 conc. — bluish black; on dilution — corinth

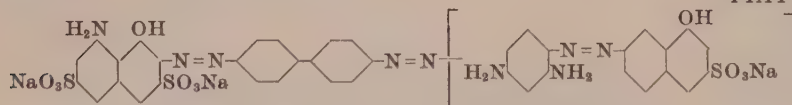
Aqueous solution + HCl conc. — violet black, ppt;

+ NaOH conc. — corinth

30090**C.I. Direct Blue 38**

Discoverer — Oehler

FIAT 764 — Toluyenschwarzblau GN



Benzidine $\begin{cases} (1) \text{ (alk.) H acid} \\ (2) \text{ (alk.) } [m\text{-Phenylenediamine (acid)} \leftarrow \text{Gamma acid}] \end{cases}$

Soluble in water (blue black)

Very slightly soluble in ethanol (weak violet)

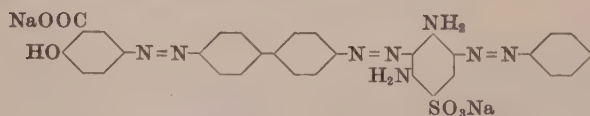
 H_2SO_4 conc. — blue; on dilution — weak violet

Aqueous solution + HCl conc. — violet grey ppt;

+ NaOH conc. — dull violet

30095**Direct Dye**

Discoverer — Kalle Co. 1913

Naphthamine Orange NG (K)

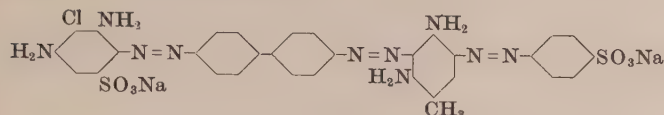
Benzidine $\begin{cases} (1) \text{ Salicylic acid} \\ (2) [2,4\text{-Diaminobenzenesulfonic acid} \leftarrow \text{Aniline}] \end{cases}$

Soluble in water (orange brown) and ethanol (golden yellow)

 H_2SO_4 conc. — violet black; on dilution — yellowish brown

Aqueous solution + HCl conc. — orange brown ppt;

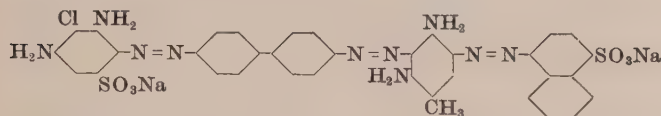
+ NaOH conc. — yellowish brown ppt.

30100 C.I. Direct Brown 17

Benzidine $\begin{cases} (1) \text{ 3,5-Diamino-4-chlorobenzenesulfonic acid} \\ (2) [\text{Toluene-2,4-diamine (acid)} \leftarrow \text{Sulfanilic acid}] \end{cases}$

Discoverer — Badische Co. 1909
cf. Bayer Co., *GP* 49139 (*Fr.* 2, 358)
FIAT 764 — Oxaminbraun GX

Slightly soluble in water (orange brown) and ethanol
 H_2SO_4 conc. — greyish blue; on dilution — yellowish brown
Aqueous solution + HCl conc. — dark brown ppt;
+ NaOH conc. — orange brown ppt.

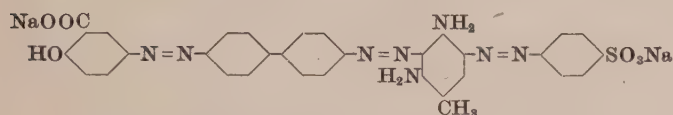
30105 Direct Dye (Brown)

Benzidine $\begin{cases} (1) \text{ 3,5-Diamino-4-chlorobenzenesulfonic acid} \\ (2) [\text{Toluene-2,4-diamine (acid)} \leftarrow \text{Naphthionic acid}] \end{cases}$

Discoverer — Badische Co.
Oxamine Brown GRX (B)

Fastness Properties (C): Acid (organic), poor; Alkali, good;
Light, poor-fair; Washing, fair; Water, poor
Dischargeability: alkaline, poor; neutral, good
cf. Bayer Co., *GP* 49139 (*Fr.* 2, 358)
FIAT 764 — Oxaminbraun GRX

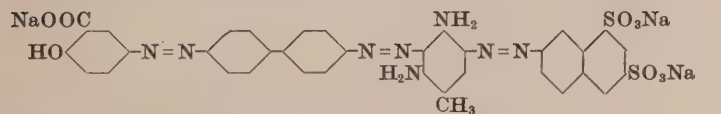
Soluble in water (orange brown); moderately soluble in alcohol
 H_2SO_4 conc. — dark blue; on dilution — dark brown
Aqueous solution + HCl conc. — brownish violet;
+ NaOH conc. — orange brown

30110 C.I. Direct Brown 1:2 (Brown)

Benzidine $\begin{cases} (1) \text{ Salicylic acid} \\ (2) [\text{Toluene-2,4-diamine} \leftarrow \text{Sulfanilic acid}] \end{cases}$

Discoverer — Cassella Co. 1904
cf. Bayer Co., *GP* 49139 (*Fr.* 2, 358)
BIOS 1548, 151; *FIAT* 764 — Columbiaorange R70

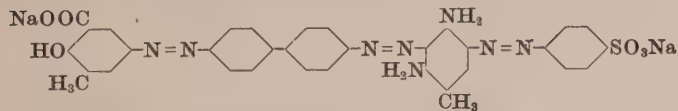
Soluble in water (yellowish olive brown)
Slightly soluble in ethanol
 H_2SO_4 conc. — dark navy blue; on dilution — weak brownish orange
Aqueous solution + HCl conc. — yellowish brown ppt;
+ NaOH conc. — brownish orange ppt.

30115 Direct Dye

Benzidine $\begin{cases} (1) \text{ Salicylic acid} \\ (2) [\text{Toluene-2,4-diamine} \leftarrow \text{7-Amino-1,3-naphthalene-disulfonic acid}] \end{cases}$

Discoverer — Badische Co.
Oxamine Brown GNX (B)
Fastness Properties (C): Acid (organic), fairly good; Light, poor-fair; Washing, fair; Water, fairly good
cf. Bayer Co., *GP* 49139 (*Fr.* 2, 358)

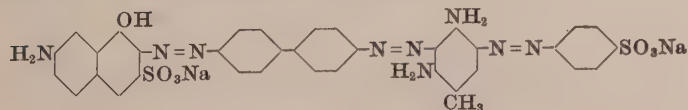
Moderately soluble in water (yellowish brown)
Very slightly soluble in ethanol
 H_2SO_4 conc. — violet black; on dilution — yellowish brown
Aqueous solution + HCl conc. — orange brown ppt;
+ NaOH conc. — orange brown

30120 C.I. Direct Brown 154 (Brown)

Benzidine $\begin{cases} (1) \text{ 2,3-Cresotic acid} \\ (2) [\text{Toluene-2,4-diamine} \leftarrow \text{Sulfanilic acid}] \end{cases}$

cf. Bayer Co., *GP* 49139 (*Fr.* 2, 358)

Soluble in water (yellowish brown)
 H_2SO_4 conc. — violet brown; on dilution — yellowish orange
Aqueous solution + HCl dil. — dark brown ppt;
+ NaOH — orange brown

30125 C.I. Direct Brown 68 (Reddish brown)

Benzidine $\begin{cases} (1) \text{ (biscarbonate) Gamma acid} \\ (2) [\text{Toluene-2,4-diamine} \leftarrow \text{Sulfanilic acid}] \end{cases}$

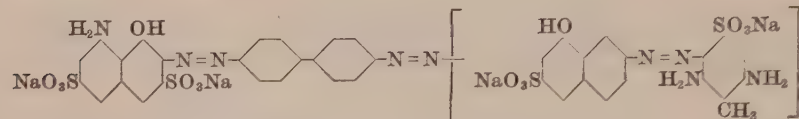
Naphthamine Brown 8B (Kalle) was a mixture obtained by performing stages (1) and (2) in one operation

Discoverer — Agfa 1897
FIAT 764 — Columbiabraun R, Naphtaminbraun BB (error for 8B)

Soluble in water (reddish brown)
 H_2SO_4 conc. — dark blue; on dilution — reddish orange brown
Aqueous solution + HCl conc. — reddish brown ppt;
+ NaOH conc. — reddish orange brown

30130 Direct Dye

Discoverer — Oehler

**Toluylene Black Blue G (By)**

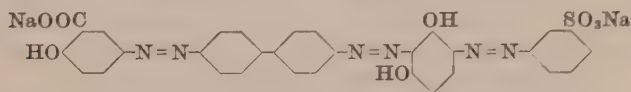
Fastness Properties (C): Acid (organic), fairly good; Alkali, good—very good; Light, poor—fair; Washing and water, moderate. Fastness to water and washing improved by development with 2-naphthol or toluene-2,4-diamine or by coupling with diazotised *p*-nitroaniline

Benzidine $\begin{cases} (1) \text{ (alk.) H acid} \\ (2) \text{ [Gamma acid} \rightarrow \text{3,5-Diamino-}p\text{-toluenesulfonic acid]} \end{cases}$

Soluble in water (navy blue to bluish black)
 H_2SO_4 conc. — deep blue; on dilution — violet
 Aqueous solution + HCl conc. — dark violet;
 + NaOH conc. — reddish violet

30135 C.I. Direct Brown 5 (Brown)

Discoverer — Kalle Co.



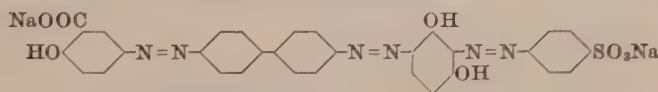
Benzidine $\begin{cases} (1) \text{ Salicylic acid} \\ (2) \text{ (alk.) [Resorcinol (acid) \leftarrow \text{Metanilic acid}]} \end{cases}$

cf. Agfa, BP 10653/88; USP 399581; FP 192331; GP 46328, 46501 (*Fr.* 2, 371, 371)
 FIAT 764 — Naphtaminbraun 4G ex.

Soluble in water (yellowish brown)
 Slightly soluble in ethanol
 H_2SO_4 conc. — reddish violet; on dilution — yellowish brown
 Aqueous solution + HCl conc. — orange brown, ppt;
 + NaOH conc. — reddish orange brown

30140 C.I. Direct Brown 6 (Brown)

Discoverer — J. Strasburger 1888



Benzidine $\begin{cases} (1) \text{ Salicylic acid} \\ (2) \text{ Resorcinol (3) \leftarrow Sulfanilic acid} \end{cases}$

Agfa, BP 10653/88; USP 399581; FP 192331; GP 46328, 46501 (*Fr.* 2, 371, 371)
 FIAT 764 — Congobraun G

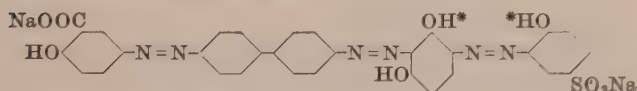
Very soluble in water (yellowish brown)
 Slightly soluble in Cellosolve; insoluble in other organic solvents
 H_2SO_4 conc. — reddish violet; on dilution — weak yellowish brown ppt.
 HNO_3 conc. — red solution (incomplete), turns brown
 Aqueous solution + HCl conc. — yellowish brown ppt;
 + NaOH dil. or conc. — orange red to red

This sequence of operations, which is that recorded for Congo Brown G, differs slightly from C.I. 1st Edition 598

30145 C.I. Direct Brown 95 (Reddish brown)

Discoverers — D. Delfs and R. Knoche 1931

Copper complex derived from



Benzidine $\begin{cases} (1) \text{ Salicylic acid} \\ (2) \text{ [Copper complex formed at * from 2-Amino-1-phenol-4-sulfonic acid} \rightarrow \text{Resorcinol]} \end{cases}$

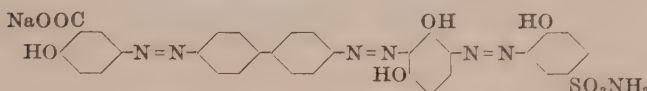
I.G., BP 388332; USP 1957580; FP 743076; GP 571859 (*Fr.* 19, 1689)
 FIAT 764 — Siriuslichtbraun BRS, BRLN
 BIOS 1548, 139, 141

Soluble in water (orange brown)
 Slightly soluble in ethanol
 Insoluble in acetone
 H_2SO_4 conc. — reddish violet; on dilution — orange brown
 HNO_3 conc. — dull violet solution (incomplete)
 Aqueous solution + HCl conc. — brown, ppt;
 + NaOH dil. or conc. — redder brown, ppt.

In Sirius Supra Brown BRLN 20% of the salicylic acid is replaced by 2,3-cresotic acid

30150 C.I. Direct Brown 175 (Brown)*

Discoverer — Ciba



Benzidine $\begin{cases} (1) \text{ Salicylic acid} \\ (2) \text{ [Resorcinol \leftarrow 2-Amino-1-phenol-4-sulfonamide]} \end{cases}$

Ciba, BP 532261; USP 2226675; *Sw.P* 208538
 Frahm, *Chem. Weekbl.* 48 (1952), 129 — Coprantine Brown 5RLL

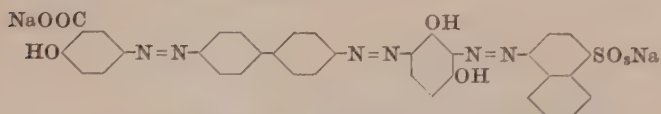
Soluble in water (orange brown)
 Slightly soluble in ethanol
 Insoluble in acetone
 H_2SO_4 conc. — reddish violet; on dilution — orange brown
 HNO_3 conc. — dull violet solution (incomplete)
 Aqueous solution + HCl conc. — brown, ppt;
 + NaOH dil. or conc. — redder brown, ppt.

Note — The formula shown is that to be expected (Kostanecki, *Ber.* 21 (1888), 3117) for coupling of resorcinol in soda ash alkalinity but USP 2226675 shows the symmetrical coupling

* Aftertreated with a copper salt

30155 C.I. Direct Brown 21 (Brown)

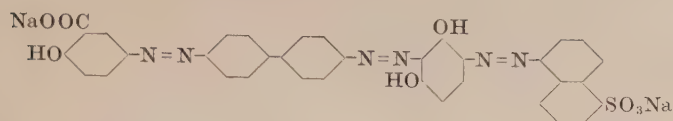
Discoverer — J. Strasburger 1888



Benzidine $\begin{cases} (1) \text{ Salicylic acid} \\ (2) \text{ Resorcinol (3) \leftarrow Naphthionic acid} \end{cases}$

Agfa, BP 10653/88; USP 399581; FP 192331; GP 46328, 46501, 46501 (*Fr.* 2, 371, 371)
 FIAT 764 — Congobraun R

Soluble in water (yellowish brown)
 Moderately soluble in ethanol
 H_2SO_4 conc. — violet; on dilution — weak brown
 Aqueous solution + HCl conc. — yellowish brown ppt;
 + NaOH conc. — orange red to scarlet

30160 Direct Dye

Benzidine $\begin{cases} (1) \text{ Salicylic acid} \\ (2) [\text{Resorcinol} \leftarrow 5\text{-Amino-1-naphthalenesulfonic acid}] \end{cases}$

Discoverer — J. Strasburger 1888

Agfa, *BP* 10653/88; *USP* 399581; *FP* 192331; *GP* 46328, 46501, (*Fr.* 2, 371, 371)

cf. Bayer Co., *GP* 44797 (*Fr.* 2, 349)

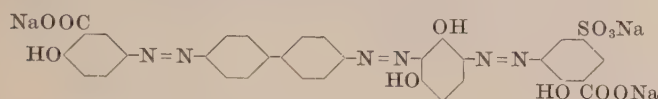
Oehler, *BP* 13402/93; *USP* 572723; *GP* 86009 (*Fr.* 4, 976)
Fierz-David, 194

Soluble in water and ethanol (red)

H_2SO_4 conc. — violet; on dilution — dark reddish brown ppt.

Aqueous solution + HCl conc. — brown ppt;

NaOH conc. — red solution

30165 C.I. Direct Brown 173 (Reddish brown)*

Benzidine $\begin{cases} (1) \text{ Salicylic acid} \\ (2) [\text{Resorcinol} \leftarrow 3\text{-Amino-5-sulfosalicylic acid}] \end{cases}$

* Direct, aftertreated with copper sulfate, brown

Discoverers — E. Fischer and A. Siebert 1940

I.G., *USP* 2394114; *GP* 758428 (*Fr.-Bayer*, I-1, 1063)

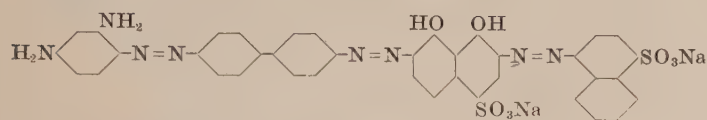
BIOS 1548, 119; *FIAT* 764 — Benzoechtkupferbraun BRL

Soluble in water (orange brown)

H_2SO_4 conc. — dark violet; on dilution — weak yellowish brown

Aqueous solution + HCl conc. — orange brown ppt;

+ NaOH conc. — redder brown

30170 Direct Dye

Benzidine $\begin{cases} (1) m\text{-Phenylenediamine} \\ (2) [4,5\text{-Dihydroxy-1-naphthalenesulfonic acid} \\ \leftarrow \text{Naphthionic acid}] \end{cases}$

Discoverers — F. Schmidt and O. Ernst 1895

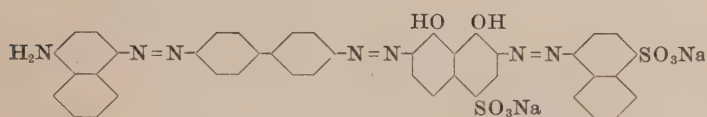
Dianil Black N (MLB). Very similar in properties to C.I.30175 but, for example, dyed direct it is a little inferior in light fastness and inferior in washing fastness

M.L.B., *GP* 91036 (*Fr.* 4, 903)

For coupling of 4,5-dihydroxy-1-naphthalenesulfonic acid
see C.I.16530

Soluble in water (dull bluish violet)

H_2SO_4 conc. — blue; on dilution — greyish violet ppt.

30175 Direct Dye

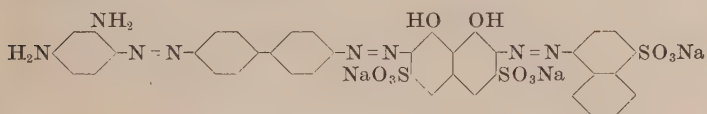
Benzidine $\begin{cases} (1) 1\text{-Naphthylamine} \\ (2) [4,5\text{-Dihydroxy-1-naphthalenesulfonic acid} \\ \leftarrow \text{Naphthionic acid}] \end{cases}$

Discoverers — F. Schmidt and O. Ernst 1895

Dianil Black G (MLB) may be diazotised and developed with 2-naphthol or toluene-2,4-diamine, coupled with diazotised *p*-nitroaniline, aftertreated with formaldehyde or with potassium dichromate/copper sulfate(*)

Fastness Properties (C): Light, Direct 3 (4*); Washing, Direct 3-4 (4*)

M.L.B., *GP* 91036 (*Fr.* 4, 903)

30180 Direct Dye

Benzidine $\begin{cases} (1) m\text{-Phenylenediamine} \\ (2) [\text{Chromotropic acid} \leftarrow \text{Naphthionic acid}] \end{cases}$

Aqueous solution + HCl conc. — violet ppt; + NaOH conc. — bluer

Discoverers — F. Schmidt and O. Ernst 1894

Dianil Black R (MLB) may be developed with 2-naphthol or toluene-2,4-diamine, coupled with diazotised *p*-nitroaniline (*) aftertreated with formaldehyde or with potassium dichromate/copper sulfate

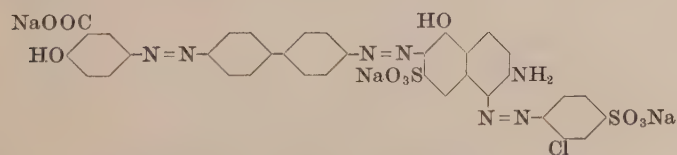
Fastness Properties (C) (*): Acid (organic), very good; Alkali, very good; Light, moderate; Washing, good; Water, very good

M.L.B., *USP* 582958; *GP* 89285 (*Fr.* 4, 905)

Moderately soluble in water (reddish violet)

Insoluble in ethanol

H_2SO_4 conc. — dark blue; on dilution — reddish violet solution and ppt.

30190 Direct Dye (Bordeaux)

Benzidine $\begin{cases} (1) \text{ Salicylic acid} \\ (2) (\text{alk.}) [\text{J acid (acid)} \leftarrow 3\text{-Chlorosulfanilic acid}] \end{cases}$

Discoverer — Oehler

Triazol Bordeaux B (GrE)

Dischargeability: neutral or alkaline, fairly good

Dyes of similar constitution —

Ciba, *GP* 126802 (*Fr.* 6, 974)

FIAT 764 — Triazolbordo B

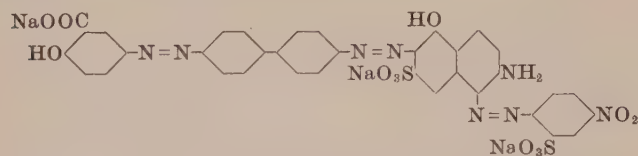
Very soluble in water (wine red)

Slightly soluble in ethanol (pink)

H_2SO_4 conc. — navy blue; on dilution — dull violet

Aqueous solution + HCl conc. — reddish brown ppt;

+ NaOH conc. — red brown

30195 Direct Dye

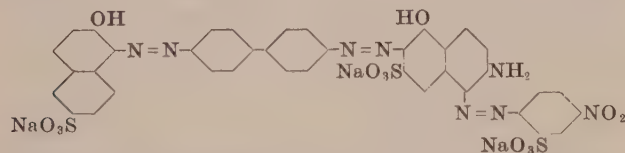
Benzidine $\begin{cases} (1) \text{ Salicylic acid} \\ (2) \text{ (alk.) [J acid (acid)} \leftarrow 2\text{-Amino-5-nitrobenzenesulfonic acid]} \end{cases}$

Discoverer — Oehler

Triazol Corinth B (GrE)

Dyes of similar constitution —
Ciba, GP 126802 (Fr. 6, 974)
FIAT 764 — Triazolkorinth B

Soluble in water (corinth)
Moderately soluble in ethanol (pink)
H₂SO₄ conc. — dark blue; on dilution — weak corinth
Aqueous solution + HCl conc. — brown, ppt;
+ NaOH conc. — corinth ppt.

30200 Direct Dye

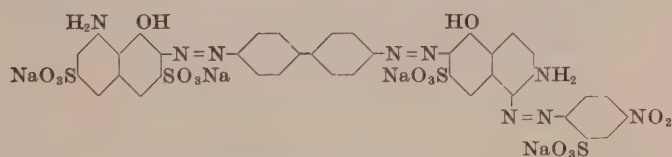
Benzidine $\begin{cases} (1) \text{ Schaeffer's acid} \\ (2) \text{ (alk.) [J acid (acid)} \leftarrow 2\text{-Amino-5-nitrobenzenesulfonic acid]} \end{cases}$

Discoverer — Oehler

Triazol Dark Blue 3R (GrE)

Dyes of similar constitution —
Ciba, GP 126802 (Fr. 6, 974)

Soluble in water (violet black)
Slightly soluble in ethanol
H₂SO₄ conc. — deep blue; on dilution — dullish violet
Aqueous solution + HCl conc. — blue black ppt;
+ NaOH conc. — violet black ppt.

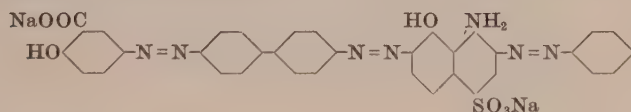
30205 C.I. Direct Blue 43 (Dull reddish blue → Navy)

Benzidine $\begin{cases} (1) \text{ (alk.) H acid} \\ (2) \text{ (alk.) [J acid (acid)} \leftarrow 2\text{-Amino-5-nitrobenzenesulfonic acid]} \end{cases}$

Discoverer — Oehler

FIAT 764 — Triazoldunkelblau B

Very soluble in water (navy blue)
Slightly soluble in ethanol
H₂SO₄ conc. — blue; on dilution — violet
Aqueous solution + HCl conc. — deep violet;
+ NaOH conc. — deep violet

30210 Direct Dye

Benzidine $\begin{cases} (1) \text{ Salicylic acid} \\ (2) \text{ (alk.) [S acid (acid)} \leftarrow \text{Aniline]} \end{cases}$

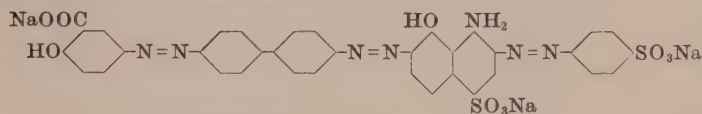
Discoverer — Agfa 1893

Columbia Black Green D (A)

Fastness Properties (C): Acid (organic), 4; Alkali, 4;
Light, 3; Washing, 2; Water, 2
Dischargeability, good

GP ap. A3574 (Fr. 4, 948)

Soluble in water (dull green); very slightly soluble in ethanol
H₂SO₄ conc. — violet black; on dilution — greyish olive green
Aqueous solution + HCl conc. — dull green ppt;
+ NaOH conc. — olive ppt.

30215 Direct Dye (Dull green)

Benzidine $\begin{cases} (1) \text{ Salicylic acid} \\ (2) \text{ (alk.) [S acid (acid)} \leftarrow \text{Sulfanilic acid]} \end{cases}$

Discoverer — Agfa 1893

Columbia Green (A)

Fastness Properties (C): Acid (organic), fairly good; Alkali, fairly good-good; Light and Washing, poor-fair; Water, fair

Dischargeability, very good

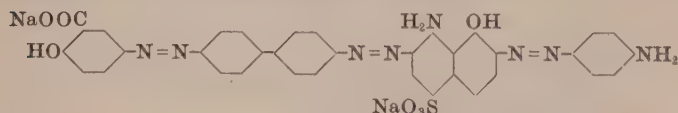
GP ap. A3574 (Fr. 4, 948)

FIAT 764 — Columbiagruen

Agfa, JSDC, 10 (1894), 10

Aqueous solution + HCl conc. — olive green ppt;
+ NaOH conc. — olive green ppt.

Soluble in water (dullish blue green)
H₂SO₄ conc. — violet black; on dilution — bluish green

30220 C.I. Direct Green 39 (Dull olive)*

Benzidine $\begin{cases} (1) \text{ Salicylic acid} \\ (2) \text{ (acid) S acid (alk.) } (3) \leftarrow p\text{-Aminooxanilic acid;} \\ \text{finally hydrolyse the oxamic acid group} \end{cases}$

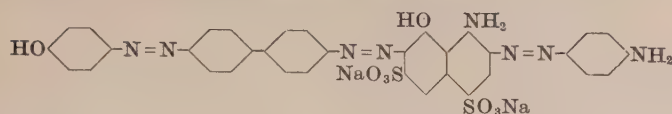
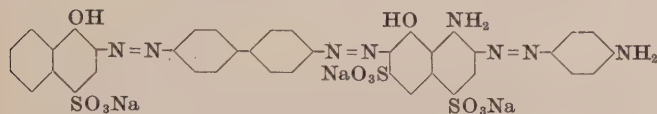
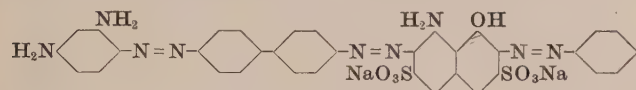
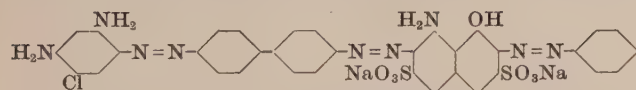
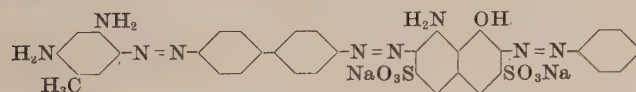
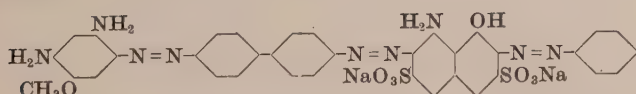
* Developed with 2-naphthol, toluene-2,4-diamine or methylphenylpyrazolone

Discoverer — K. Heidenreich 1910

Bayer Co., BP 25292/10; USP 1009745; FP 428877; GP 234636
(Fr. 10, 892)

FIAT 764 — Diazooliv G

Moderately soluble in water (olive)
H₂SO₄ conc. — blackish violet, blue and orange;
on dilution — olive
Aqueous solution + HCl conc. — reddish olive brown ppt;
+ NaOH conc. — brownish olive, ppt.

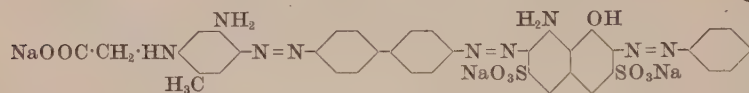
30225 C.I. Direct Green 58 (Dull green)*Benzidine \swarrow (2) Phenol(1) (alk.) [K acid (acid) \leftarrow *p*-Nitroaniline];
finally reduce the nitro group with sodium sulfide* Coupled with diazotised *p*-nitroanilineDiscoverer — Cassella Co. 1907
FP 394491; GP 204707 (Fr. 9, 375)
FIAT 764 — Diaminnitrazolgruen SModerately soluble in water (bluish green)
Slightly soluble in ethanol
H₂SO₄ conc. — violet black; on dilution — weak dull violet
Aqueous solution + HCl conc. — dark bluish grey ppt;
+ NaOH conc. — dark greenish grey**30230 Direct Dye**Benzidine \swarrow (2) Neville and Winther's acid(1) (alk.) [K acid (acid) \leftarrow *p*-Nitroaniline];
finally reduce the nitro group with sodium sulfideDiscoverer — Kalle Co.
Naphthamine Blue BE (K)Soluble in water (dark blue)
Slightly soluble in ethanol
H₂SO₄ conc. — deep blue; on dilution — corinth
Aqueous solution + HCl conc. — dark blue ppt;
+ NaOH conc. — navy blue**30235 C.I. Direct Black 38 (Black)**Benzidine \swarrow (3) *m*-Phenylenediamine(1) (acid) H acid (alk.) (2) \leftarrow AnilineHNO₃ conc. — yellowish brown solution (incomplete)
HCl conc. — dull reddish black solution (incomplete)
Aqueous solution + HCl conc. — corinth ppt;
+ NaOH conc. — greyish blue ppt.Discoverers — M. Kahn and M. Herzberg 1898; O. Müller 1901
Schoellkopf, Hartford and Hanna Co., USP 688478; GP 153557
(Fr. 7, 430)
Agfa, BP 12305/02; USP 717550; FP 321626; GP ap. A8974
(Fr. 7, 425)
FIAT 764 — Direkttiefschwarz E ex; Oxydiaminschwarz JE
ex. kz.
Fierz-David, 196
Fierz-David & Blangey, 291Soluble in water (greenish black)
Moderately soluble in ethanol (greenish blue black) and Cellosolve
Insoluble in other organic solvents
H₂SO₄ conc. — dark reddish blue; on dilution — corinth to
reddish black ppt.**30240 C.I. Direct Black 11 (Greenish black)**Benzidine \swarrow (3) 4-Chloro-*m*-phenylenediamine(1) (acid) H acid (alk.) (2) \leftarrow AnilineDiscoverer — Bayer Co.
FIAT 764 — Direkttiefschwarz 9577Soluble in water (grey black) and ethanol (bluish grey)
H₂SO₄ conc. — reddish blue solution; on dilution — corinth
HCl conc. — violet solution
Aqueous solution + HCl conc. — corinth ppt;
+ NaOH conc. — bluish grey, ppt.**30245 C.I. Direct Black 4 (Black)**Benzidine \swarrow (3) Toluene-2,4-diamine(1) (acid) H acid (alk.) (2) \leftarrow AnilineAqueous solution + HCl conc. — corinth ppt;
NaOH conc. — greyish blue ppt.Discoverers — M. Kahn and M. Herzberg 1898; O. Müller 1901
Schoellkopf, Hartford & Hanna Co., USP 688478; GP 153557
(Fr. 7, 430)
Agfa, BP 12305/02; USP 717550; FP 321626; GP ap. A8974
(Fr. 7, 425)
FIAT 764 — Direkttiefschwarz RW ex.Soluble in water (greyish black)
Moderately soluble in ethanol (bluish grey) and Cellosolve
Insoluble in other organic solvents
H₂SO₄ conc. — dark reddish blue; on dilution — corinth to
reddish black ppt.
HNO₃ conc. — brown solution (incomplete)
HCl conc. — dull red solution (incomplete)**30250 Direct Dye**Benzidine \swarrow (3) 4-Methoxy-*m*-phenylenediamine(1) (acid) H acid (alk.) (2) \leftarrow AnilineAqueous solution + HCl conc. — ppt;
+ NaOH conc. — bluish black ppt.Discoverer — J. Dedichen 1902
Columbia Violet Black O (A)
Fastness Properties (C): Acid (organic), fair; Alkali, good;
Light, Washing and Water, fair
Dischargeability, good
Agfa, BP 12305/02; USP 717550; GP ap. A8974 (Fr. 7, 425)
FIAT 764 — Columbiavioletttschwarz O ex. kz.Moderately soluble in water (corinth) and ethanol (dull greenish
blue)
H₂SO₄ conc. — dark blue; on dilution — corinth

30255 Leather Dye (Black)

Discoverer — Bayer Co. 1900

Chrome Leather Black M (By)

Chrome leather dye. Penetration poor



Benzidine \leftarrow *N*-(5-Amino-*o*-tolyl)glycine
 (1) (acid) H acid (alk.) (2) \leftarrow Aniline

Soluble in water (grey black)

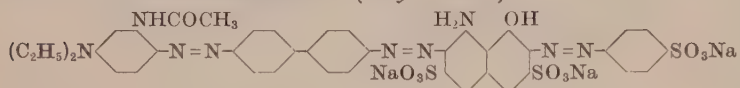
 H_2SO_4 conc. — bluish black; on dilution — greyish violetAqueous solution + HCl conc. — dull violet, ppt;+ NaOH conc. — bluish grey, ppt.**30260 C.I. Acid Black 69 (Black)**

Discoverers — E. Glietenberg and F. Schubert 1935

C.I. Direct Black 41 (Grey \rightarrow Black)

I.G., BP 452300; USP 2103778; FP 801306; GP 667860 (Fr. 25, 680)

FIAT 764 — Chromlederechtschwarz S kz. "F"



Benzidine \leftarrow (3) *m*-Diethylaminoacetanilide
 (1) (acid) H acid (alk.) (2) \leftarrow Sulfanilic acid

Soluble in water (violet black)

 H_2SO_4 conc. — navy blue; on dilution — violet greyAqueous solution + HCl conc. — dull violet ppt;+ NaOH conc. — bluish grey ppt.**30265 Direct Dye**

Discoverers — M. Böniger and J. Lagutt 1898

Chloramine Black N (S)

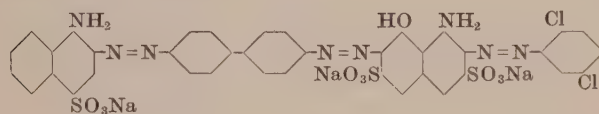
Dyes cotton, wool/cotton and wool/silk unions greenish black

Dischargeability, good

Sandoz, BP 8503/99; USP 627679; FP 287971

Cassella Co., GP 112820 (Fr. 6, 1004)

(C.I.588 1st Ed.) — corrected



Benzidine \leftarrow (2) Naphthionic acid
 (1) (alk.) [H acid (acid) \leftarrow 2,5-Dichloroaniline]

The constitution given in C.I. 1st Edition 588 was incorrect

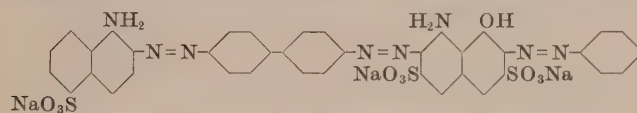
Soluble in water (dark bluish green)

 H_2SO_4 conc. — blue; on dilution — blue ppt.Aqueous solution + HCl conc. — blue ppt;+ NaOH conc. — bluish green ppt.**30270 C.I. Direct Black 131 (Greenish navy \rightarrow Black)**

Discoverer — Agfa 1902

Agfa, BP 20375/02; FP 321626; GP ap. A9323 (Fr. 8, 688)

FIAT 764 — Paradiaminblauschwarz 3B ex. kz.

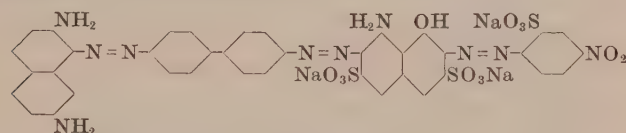


Benzidine \leftarrow (3) 5-Amino-1-naphthalenesulfonic acid
 (1) (acid) H acid (alk.) (2) \leftarrow Aniline

Aqueous solution + HCl conc. — bluish black ppt;
+ NaOH conc. — bluish black

Soluble in water (dark bluish grey)

Slightly soluble in ethanol

 H_2SO_4 conc. — bluish black; on dilution — greyish blue**30275 C.I. Acid Black 66**

Benzidine \leftarrow (3) 2,7-Naphthalenediamine
 (1) (acid) H acid (alk.) (2) \leftarrow 2-Amino-5-nitrobenzenesulfonic acid

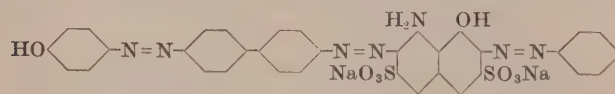
Soluble in water (reddish black)

 H_2SO_4 conc. — blue; on dilution — reddish black ppt.Aqueous solution + HCl conc. or NaOH conc. — little change**30280 C.I. Direct Green 1 (Dull green)**

Discoverer — M. Kahn (Bayer Co.) 1898

Schoellkopf, Hartford & Hanna Co., USP 688478; FP 321626;
GP 153557 (Fr. 7, 430)

BIOS 1548, 181; FIAT 764 — Benzodunkelgruen B



Benzidine \leftarrow (3) Phenol
 (1) (acid) H acid (alk.) (2) \leftarrow Aniline

Very soluble in water (bluish green) and Cellosolve

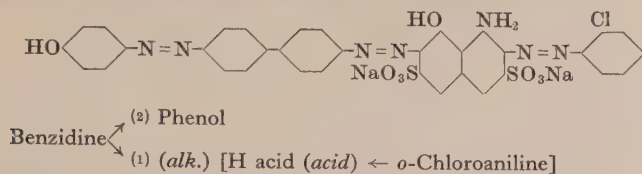
Moderately soluble in ethanol and acetone

Insoluble in other organic solvents

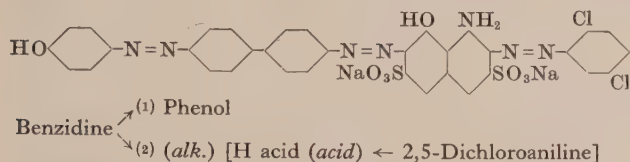
 H_2SO_4 conc. — dark blue to blue black; on dilution — black ppt. HNO_3 conc. — partial solution, brown becoming redderAqueous solution + HCl conc. — greyish violet ppt;+ NaOH conc. — dull bluish violet ppt.

30285 C.I. Direct Green 10 (Dull bluish green)

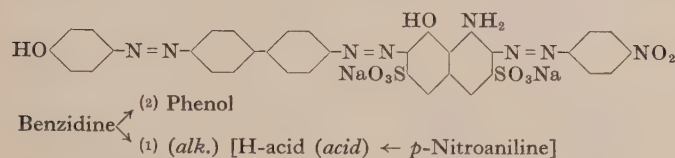
Discoverers — C. Ris and C. Simon 1909

Cassella Co., *USP* 655013; *FP* 298655; *GP* 116521 (*Fr.* 6, 1006)
FIAT 764 — Diamingruen CLSoluble in water (bluish green) and ethanol (greenish blue)
 H_2SO_4 conc. — violet black (+ blue); on dilution — violet grey
Aqueous solution + HCl conc. — violet grey ppt;
+ NaOH conc. — dark grey green**30290 C.I. Direct Green 12 (Dull bluish green)**

Discoverers — M. Böniger and J. Lagutt 1898

Sandoz, *BP* 8503/99; *USP* 627679, 652456; *FP* 287971
Cassella Co., *GP* 112820 (*Fr.* 6, 1004)Soluble in water (green) and ethanol
Very soluble in Cellosolve; slightly soluble in acetone
 H_2SO_4 conc. — bluish violet; on dilution — dark blue ppt.
 HNO_3 conc. — brownish purple, becoming blacker
 NaOH (10%) — greenish black solution**30295 C.I. Direct Green 6 (Dull green)**

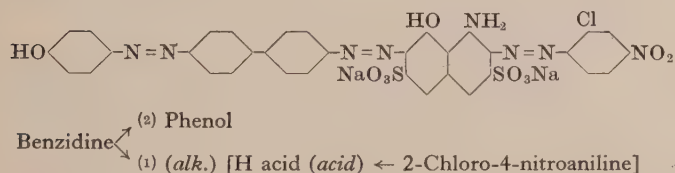
Discoverers — M. Hoffmann and C. Daimler 1891

Cassella Co., *BP* 15725/91; *USP* 514599; *FP* 201770; *GP* 66351
(*Fr.* 3, 677)Aqueous solution + HCl conc. — dull bluish green ppt; + H_2SO_4 (10%) — bluer; + NaOH conc. — dark green to olive*BIOS* 1548, 185; *FIAT* 764 — Diamingruen B
Fierz-David & Blangey, 288Soluble in water (dark green), acetone and Cellosolve
Slightly soluble in ethanol
Insoluble in other organic solvents
 H_2SO_4 conc. — violet black; on dilution — violet grey to black
 HCl conc. — and HNO_3 conc. — violet**30300 Direct Dye**

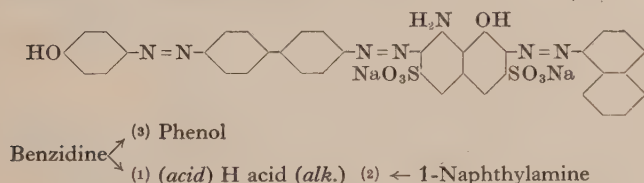
Discoverer — C. Simon 1898

Diphenyl Green G (Gy)

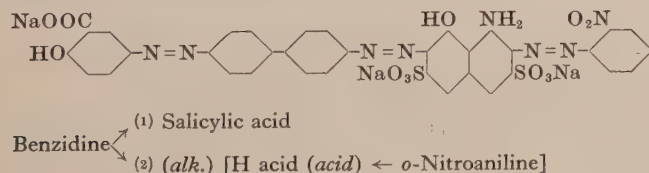
Dischargeability, good

Geigy Co., *USP* 628233Soluble in water (dark green) and ethanol (violet)
 H_2SO_4 conc. — violet; on dilution — black ppt.
Aqueous solution + HCl conc. — black ppt;
+ NaOH conc. — dull green**30305 C.I. Direct Green 19 (Dull green)**

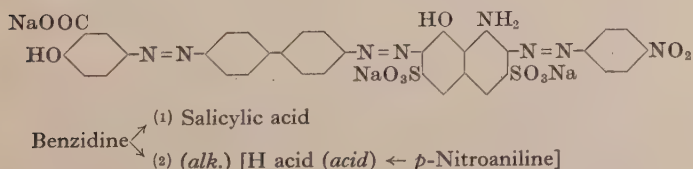
Discoverer — M. Kahn (Bayer Co.) 1899

Schoellkopf, Hartford & Hanna Co., *USP* 688478; *FP* 321626;
GP 153557 (*Fr.* 7, 430)*FIAT* 764 — Benzodunkelgruen GGSoluble in water (green)
Moderately soluble in ethanol (green)
 H_2SO_4 conc. — dark navy blue; on dilution — weak grey
Aqueous solution + HCl conc. — weak greyish green ppt;
+ NaOH conc. — olive green ppt.**30310 C.I. Direct Green 9 (Dull green)**

Discoverers — M. Hoffmann and C. Daimler 1891

BIOS 1548, 185; *FIAT* 764 — Diamingruen G*Fierz-David*, 193Very soluble in water (green)
Soluble in ethanol (bluish green)
 H_2SO_4 conc. — violet black; on dilution — greyish green
Aqueous solution + HCl conc. — bluish green ppt;
+ NaOH conc. — greenish olive ppt.**30315 C.I. Direct Green 8 (Dull green)**

Discoverers — M. Hoffmann and C. Daimler 1891

Cassella Co., *BP* 15725/91; *USP* 514599; *FP* 201770; *GP* 66351
(*Fr.* 3, 677)*FIAT* 764 — Columbiagrueen G*JSDC*, 12 (1896), 69Soluble in water (green)
Slightly soluble in ethanol, acetone and Cellosolve
Insoluble in other organic solvents
 H_2SO_4 conc. — dull bluish violet; on dilution — dull olive green
Aqueous solution + HCl conc. — bluish green ppt;
+ NaOH conc. — yellowish olive green ppt;
+ NaOH (10%) — dull green

30320

Direct Dye

Discoverer — C. Simon 1898

Diphenyl Green 3G (Gy)

Geigy Co., USP 628233; cf. —

Cassella Co., GP 112820 (Fr. 6, 1004)

Sandoz, BP 8503/99; USP 627679; FP 287971

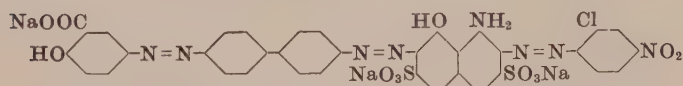
Soluble in water (green)

Slightly soluble in ethanol (green)

H₂SO₄ conc. — reddish violet; on dilution — green ppt.

Aqueous solution + HCl conc. — green ppt;

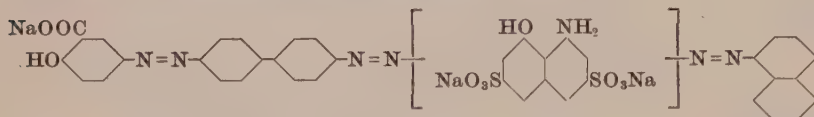
+ NaOH conc. — dull green solution, ppt. with excess



Benzidine $\begin{cases} (1) \text{ Salicylic acid} \\ (2) \text{ (alk.) [H acid (acid) } \leftarrow \text{ 2-Chloro-4-nitroaniline]} \end{cases}$

30325

C.I. Direct Brown 75 (Dull reddish brown)



Benzidine $\begin{cases} \text{Salicylic acid} \\ \text{H acid } \leftarrow \text{ 1-Naphthylamine} \end{cases}$

H₂SO₄ conc. — reddish blue; on dilution — reddish violet solution and ppt.HNO₃ conc. — brown

Aqueous solution + HCl conc. — dull violet ppt;

+ NaOH conc. — brownish red

30330

C.I. Direct Green 7 (Bluish green)

Discoverers — M. Böniger and J. Lagutt 1899

Sandoz, BP 8503/99; USP 627629; FP 287971

Cassella Co., GP 112820 (Fr. 6, 1004)

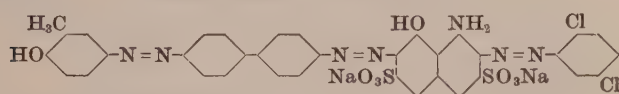
FIAT 764 — Diamingruen FG

Soluble in water (dark green) and ethanol (blue green)

H₂SO₄ conc. — violet; on dilution — grey

Aqueous solution + HCl conc. — greyish violet ppt;

+ NaOH conc. — dark grey ppt.



Benzidine $\begin{cases} (2) \text{ o-Cresol} \\ (1) \text{ (alk.) [H acid (acid) } \leftarrow \text{ 2,5-Dichloroaniline]} \end{cases}$

30335

Direct Dye (Greenish black)

Discoverers — H. Clingstein, E. Glietenberg, and O. Goos 1932

Artificial Silk Black AS Extra (IG)

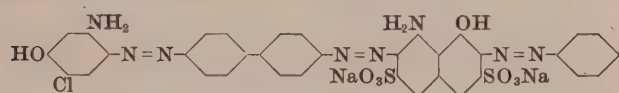
Fastness Properties (C): Acid (organic), good; Alkali, fairly

good; Light, fairly good; Washing and Water, poor-fair

Dischargeability: neutral, fairly good; alkaline, fair

I.G., BP 430252; USP 2073000; FP 765752; GP 621186 (Fr. 21, 931)

FIAT 764 — Kunstseidenschwarz AS ex.



Benzidine $\begin{cases} (3) \text{ (alk.) 5-Amino-2-chlorophenol} \\ (1) \text{ (acid) H acid (alk.) (2) } \leftarrow \text{ Aniline} \end{cases}$

Aqueous solution + HCl conc. — grey black ppt;
+ NaOH conc. — dullish violet

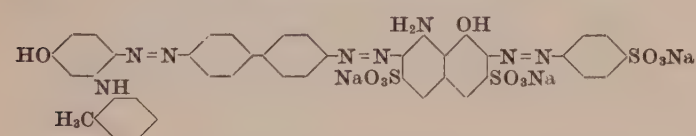
Moderately soluble in water (violet grey to black)

H₂SO₄ conc. — navy blue; on dilution — violet grey

30336

C.I. Acid Black 94 (Bluish black)*

Discoverer — Sandoz



Benzidine $\begin{cases} (3) \text{ (alk.) 3-o-Toluidinophenol} \\ (1) \text{ (acid) H acid (2) (alk.) } \leftarrow \text{ Sulfanilic acid} \end{cases}$

* On leather

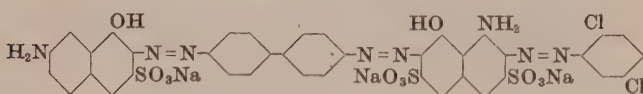
30340

C.I. Direct Blue 51 (Navy → Bluish black)

Discoverers — M. Böniger and J. Lagutt 1898

Sandoz, BP 8503/99; USP 627679; FP 287971

Cassella Co., GP 112820 (Fr. 6, 1004)



Benzidine $\begin{cases} (2) \text{ (alk.) Gamma acid} \\ (1) \text{ (alk.) [H acid (acid) } \leftarrow \text{ 2,5-Dichloroaniline]} \end{cases}$

Soluble in water (blue)

H₂SO₄ conc. — blue; on dilution — violet blue ppt.

30345

C.I. Direct Black 14 (Bluish black)

Discoverers — M. Hoffmann and C. Daimler 1891

Cassella Co., BP 15725/91; USP 514599; FP 201770; GP 66351 (Fr. 3, 677)

BIOS 1548, 195; FIAT 764 — Diaminschwarz HW

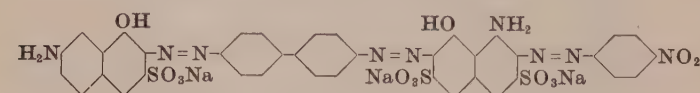
Soluble in water (dark blue) and ethanol (bluish green)

H₂SO₄ conc. — dark blue to blue black; on dilution — violet black

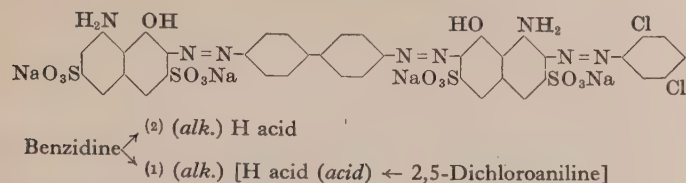
Aqueous solution + HCl conc. — navy blue ppt;

+ H₂SO₄ (10%) — slightly redder;

+ NaOH conc. — dark blue ppt.

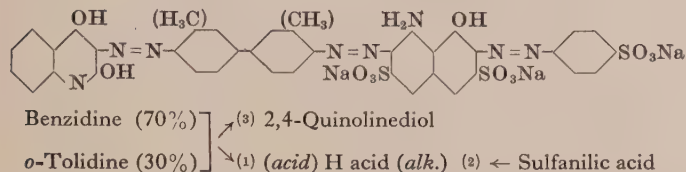


Benzidine $\begin{cases} (2) \text{ (alk.) Gamma acid} \\ (1) \text{ (alk.) [H acid (acid) } \leftarrow \text{ p-Nitroaniline]} \end{cases}$

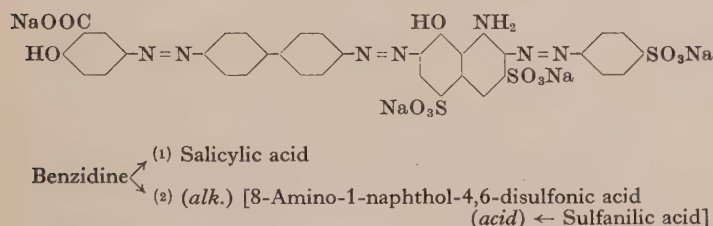
30350 C.I. Direct Blue 11 (Dull blue)*Discoverers* — M. Böniger and J. Lagutt 1898Sandoz, *BP* 8503/99; *USP* 627679, 652456; *FP* 287971
Cassella Co., *GP* 112820 (*Fr.* 6, 1004)

Soluble in water (dull greenish blue)

Very slightly soluble in ethanol; insoluble in acetone

 H_2SO_4 conc. — dull reddish to greyish blue; on dilution — dull reddish blue ppt.Aqueous solution + H_2SO_4 (10%) — trace redder;
+ NaOH conc. — redder and brighter**30355 C.I. Acid Black 70 (Greenish black)***Discoverers* — K. Holzach, L. Neumann, and H. Krzikalla 1935*FIAT* 764 — Chromlederechtschwarz V kz. "F"

Soluble in water (violet grey to black)

 H_2SO_4 conc. — navy blue; on dilution — violet grey brownAqueous solution + HCl conc. — violet grey brown ppt;
+ NaOH conc. — dull blue ppt.**30360★ Direct Dye***Discoverer* — F. Bender 1895**Eboli Green B; CW; S; ST; T (L)**

Washing fastness improved by aftertreatment with potassium dichromate or chromium fluoride

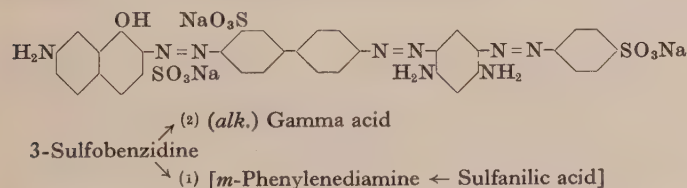
Leonhardt Co., *BP* 19253/95; *USP* 606439; *FP* 258853; *GP ap.* F8626 (*Fr.* 4, 567, 764)

Soluble in water (green)

 H_2SO_4 conc. — T—reddish violet; ST—dark green; on dilution — green ppts.

Aqueous solution + HCl conc. — green ppts;

+ NaOH conc. — T—turbid solution, ST—soluble green ppt.

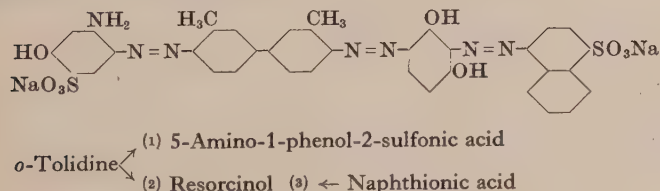
30365 C.I. Direct Brown 69 (Reddish brown)*Discoverer* — M.L.B.*FIAT* 764 — Dianilbraun R

Soluble in water (reddish orange brown)

 H_2SO_4 conc. — violet grey to black; on dilution — brown

Aqueous solution + HCl conc. — brown, ppt;

+ NaOH conc. — orange brown

30370 Direct Dye*Discoverer* — C. Rudolph 1892**Azo Corinth (GrE)**

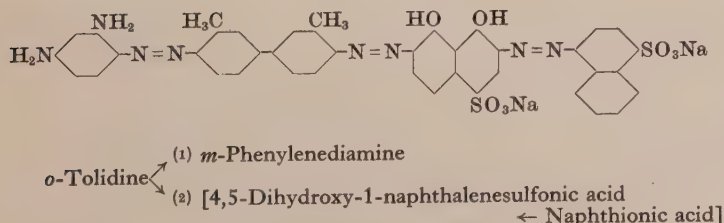
Acid, poor; Alkali, good; Light, poor; Washing and Water, fairly good

Oehler, *BP* 13402/93; *USP* 516381; *GP* 71182 (*Fr.* 3, 693)

Soluble in water (reddish brown)

 H_2SO_4 conc. — bluish violet; on dilution — reddish brown, ppt.

Aqueous solution + HCl conc. — reddish brown, ppt.

30375 Direct Dye*Discoverers* — F. Schmidt and O. Ernst 1895**Dianil Black T (MLB)**

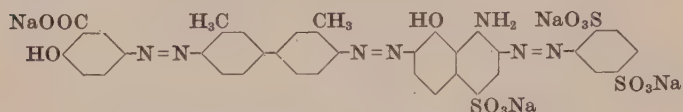
Very similar in properties to C.I.30175 but dyed direct is a little inferior in light fastness and inferior in washing fastness. Aftertreated potassium dichromate/copper sulfate it is slightly superior in light fastness and slightly inferior in washing fastness

M.L.B., *GP* 91036 (*Fr.* 4, 903)

For coupling of 4,5-dihydroxy-1-naphthalenesulfonic acid see C.I.16530

Soluble in water (dull bluish violet)

 H_2SO_4 conc. — dull reddish blue; on dilution — greyish violet ppt.

30380 C.I. Direct Green 20 (Dull green)

o-Tolidine $\begin{cases} (1) \text{ Salicylic acid} \\ (2) \text{ (alk.) [S acid (acid) } \leftarrow \text{ 2-Amino-}p\text{-benzenedisulfonic acid]} \end{cases}$

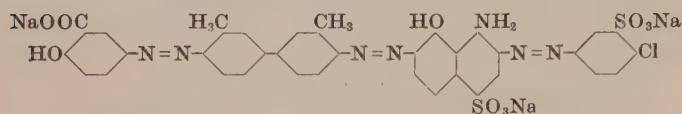
Discoverer — W. Bergdolt 1909

FIAT 764 — Benzogruen FF, FFG

Bayer Co., BP 2393/10; USP 974346; FP 415662; GP 250330 (Fr. 10, 894)

Soluble in water (deep green)

H₂SO₄ conc. — dark blue to violet black; on dilution — leaf green
Aqueous solution + HCl conc. — olive green, ppt;
+ NaOH conc. — dull bluish green

30385 Direct Dye (Dull bluish green)

o-Tolidine $\begin{cases} (1) \text{ Salicylic acid} \\ (2) \text{ (alk.) [S acid (acid) } \leftarrow \text{ 6-Chlorometanilic acid]} \end{cases}$

Discoverer — M. Ulrich (Bayer Co.) 1897

Benzo Green G (By)

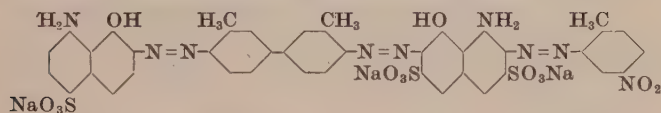
Fastness Properties (C): Acid (organic), fairly good; Alkali, good; Light, poor-fair; Water, fair
Dischargeability, good

Agfa, GP ap. A3574 (Fr. 4, 948)

FIAT 764 — Benzogruen G

Soluble in water (deep green)

H₂SO₄ conc. — violet black; on dilution — green
Aqueous solution + HCl conc. — olive green, ppt;
+ NaOH conc. — dull bluish green, ppt.

30390 C.I. Direct Blue 39 (Dull greenish blue)

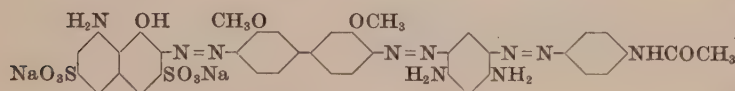
o-Tolidine $\begin{cases} (2) \text{ (alk.) S acid} \\ (1) \text{ (alk.) [H acid (acid) } \leftarrow \text{ 5-nitro-}o\text{-toluidine]} \end{cases}$

Discoverer — Cassella Co. 1891

FIAT 764 — Diaminstahlblau L

Very soluble in water (blue black)

Moderately soluble in ethanol (weak blue)
H₂SO₄ conc. — blue black; on dilution — dullish violet
Aqueous solution + HCl conc. — navy blue ppt;
+ NaOH conc. — navy blue

30395 C.I. Direct Black 20 (Navy → Bluish black)

o-Dianisidine $\begin{cases} (1) \text{ (alk.) H acid} \\ (2) \text{ } m\text{-Phenylenediamine} \end{cases} \begin{cases} (3) \leftarrow p\text{-Aminoacetanilide} \end{cases}$

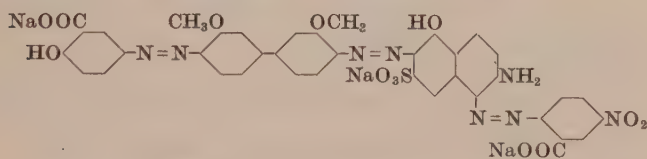
Discoverers — A. Blank, W. A. Israel, and M. Herzberg 1893

Bayer Co., BP 7330/93; USP 561694, 561709; FP 229776; GP 97437 (Fr. 5, 583)

FIAT 764 — Direktblauschwarz BM

Moderately soluble in water (violet black) and ethanol (dullish violet)

H₂SO₄ conc. — greyish black; on dilution — dullish violet
Aqueous solution + HCl conc. — dullish violet ppt;
+ NaOH conc. — corinth ppt.

30400 C.I. Direct Black 91 (Reddish black)*

o-Dianisidine $\begin{cases} \text{Salicylic acid} \\ \text{[J acid (acid) } \leftarrow \text{ 5-Nitroanthranilic acid]} \end{cases}$

Discoverer — Geigy Co.

BP 579063; Sw.P 250815

Frahm, Chem. Weekbl. 48 (1952), 130 — Cuprophenyl Black RL

* Aftertreated with copper sulfate

NOTES

TRISAZO DYES — II

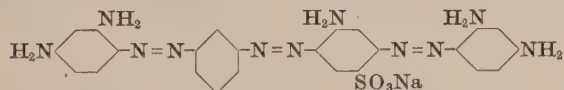
DYES OF GENERAL FORMULA: $D \begin{matrix} \nearrow E \\ \searrow M \rightarrow E' \end{matrix}$

The properties of the members of this sub-group are very similar to those of the first Trisazo sub-group. All are Direct dyes with, in some cases, important use as Leather dyes.

The sequence of components used for the arrangement of the dyes is tetrazotisable diamine (D), end component (E), end component (E') and finally middle component (M). They fall into the following groups —

| C.I. Numbers | Nature of "D" Component | Nature of "E" Component | Hues | Number of Dyes Contained |
|--------------|--|--|---|--------------------------|
| 31500–31530 | <i>m</i> -Phenylenediamine | <i>m</i> -Diamine or Resorcinol | Brown | 7 |
| 31535–31680 | <i>p</i> -Phenylenediamine | Arylamine, Resorcinol, Naphthol-sulfonic acid, Aminonaphthol-sulfonic acid | Dark blue, olive, brown, black | 30 |
| 31685–31855 | Benzidine | Salicylic acid Arylamine, Naphtholsulfonic acid, Aminonaphtholsulfonic acid | Brown, olive Violet, dark blue, brown, black | 22 14 |
| 31860–31870 | Disulfobenzidine | Phenol, Naphtholsulfonic acid | Blue, brown | 3 |
| 31875–31935 | <i>o</i> -Tolidine | Various | Red, violet, blue, brown, black | 13 |
| 31940–31970 | <i>o</i> -Dianisidine | Various | Violet, blue, black | 8 |
| 31980–31985 | 4,4'-Diamino-2,2'-stilbene-disulfonic acid | Phenol | Green | 2 |
| 31995–32010 | Diaminodiphenylamine | <i>m</i> -Phenylenediamine, Gamma acid | Black | 4 |
| 32015–32040 | Diaminocarbanilide and Diaminobenzanilide | Various | Orange, green, brown | 6 |
| 32045–32055 | 1,4-Naphthalenediamine | <i>m</i> -Diamines, 1-Naphtholsulfonic acid | Blue, black | 3 |
| | | | TOTAL | 112 |

31500 C.I. Direct Brown 138 (Reddish brown)*



m-Aminoformanilide $\xrightarrow{(2) \text{ hydrolyse amide group }}$ $\xrightarrow{(1) \text{ 2,4-Diaminobenzenesulfonic acid }}$ \Rightarrow (3) *m*-Phenylenediamine (2 mol.)

* Developed with 2-naphthol

Discoverer — W. Bergdolt 1911

Bayer Co., BP 22529/11; USP 1052647; FP 448362; GP 254277 (Fr. 11, 413)

FIAT 764 — Diazobraun 3R

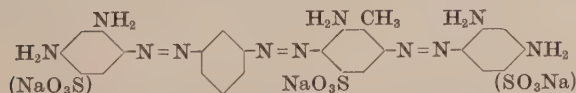
Soluble in water (orange brown)

Slightly soluble in ethanol

H₂SO₄ conc. — grey to violet black; on dilution — yellow to orange brown

Aqueous solution + HCl conc. — dark brown ppt; + H₂SO₄ 10% — no change; + NaOH conc. — orange brown; + NaOH 10% — slightly redder

31505 C.I. Direct Brown 132 (Reddish brown)*



m-Aminoformanilide $\xrightarrow{(2) \text{ hydrolyse amide group }}$ $\xrightarrow{(1) \text{ 3,5-Diamino-}p\text{-toluenesulfonic acid }}$ \Rightarrow (3) $\left[\begin{matrix} 90\% \text{ } m\text{-Phenylenediamine} \\ 10\% \text{ 2,4-Diaminobenzenesulfonic acid} \end{matrix} \right]$ (2 mol.)

* Developed with 2-naphthol

Discoverer — W. Bergdolt 1911

Bayer Co., BP 22529/11; USP 1052647; FP 448362; GP 254277 (Fr. 11, 413)

FIAT 764 — Diazobraun 3RB

Soluble in water (orange brown) and ethanol (reddish orange brown)

Very slightly soluble in Cellosolve

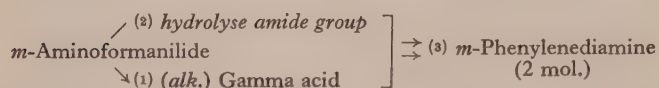
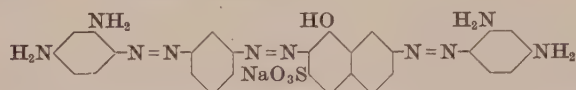
Insoluble in other organic solvents

H₂SO₄ conc. — dull greenish blue; on dilution — yellowish brown

HNO₃ conc. — reddish brown. H₂SO₄ 10% — blackish brown

Aqueous solution + HCl conc. — orange brown ppt;
NaOH conc. — orange brown ppt.

31510 C.I. Direct Brown 153 (Dull reddish brown)*



(In **Plutobraun RM (IG)** 20% of the *m*-phenylenediamine was replaced by 2,4-diaminobenzenesulfonic acid)

* Developed with diazotised *p*-nitroaniline

Discoverers — W. Bergdolt and A. Blank 1909

Bayer Co., BP 8144/09; USP 971111-2; FP 411325; GP 235591 (Fr. 10, 867)

FIAT 764 — Plutobraun RM

Soluble in water

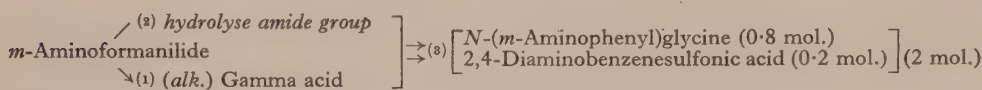
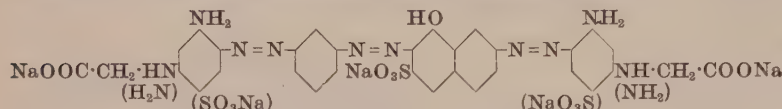
Moderately soluble in ethanol (reddish brown)

H₂SO₄ conc. — brownish red to corinth; on dilution — brown

Aqueous solution + HCl conc. — brown ppt;

+ NaOH conc. — reddish brown

31515 C.I. Direct Brown 166 (Brown → Reddish brown)*



Prepare (*m*-aminophenyl)glycine immediately before use from *m*-phenylenediamine and chloroacetic acid in aqueous solution

* Coupled with diazotised *p*-nitroaniline

Discoverers — W. Bergdolt and A. Blank 1909

Bayer Co., BP 8144/09; USP 971111-2; FP 411325; GP 235591 (Fr. 10, 867)

BIOS 1548, 191; FIAT 764 — Parabraun RK

Soluble in water (reddish brown)

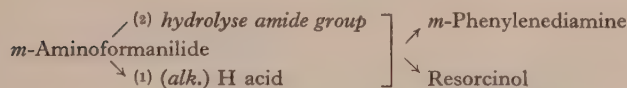
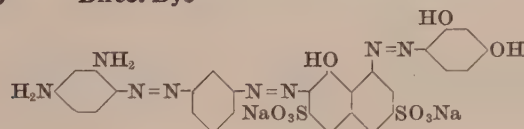
Very slightly soluble in ethanol

H₂SO₄ conc. — dull bordeaux to violet; on dilution — reddish brown

Aqueous solution + HCl conc. — chocolate brown ppt;

+ NaOH conc. — bordeaux

31520 Direct Dye



Discoverer — A. Blank 1910

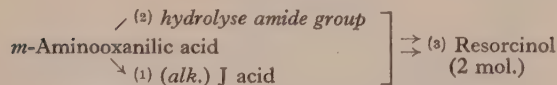
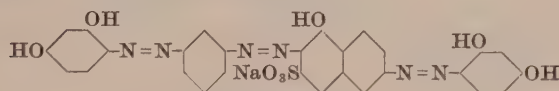
Para Bronze NB (By) may be coupled with diazotised *p*-nitroaniline

Bayer Co., BP 412/11; USP 1023120; FP 430526; GP 239533 (Fr. 10, 867)

FIAT 764 — Parabronze NB

Moderately soluble in water

31525 C.I. Direct Red 50 (Bordeaux)



Discoverer — F. Klingemann 1912

Cassella Co., BP 6900/14; USP 1150825; FP 476961; GP ap. C 24261 (Fr. 12, 355)

Joyce, Ind. Eng. Chem., 13 (1921), 946

Soluble in water (reddish orange brown)

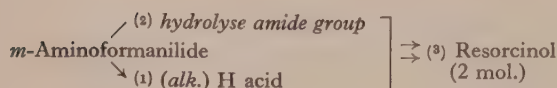
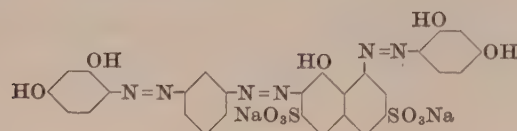
Very slightly soluble in ethanol

H₂SO₄ conc. — violet black; on dilution — orange

Aqueous solution + HCl conc. — reddish orange brown;

+ NaOH conc. — bordeaux

31530 Direct Dye



Discoverer — A. Blank 1910

Para Bronze NG (By)

Fastness Properties (C), coupled with diazotised *p*-nitroaniline: Acid (organic) 5, Alkali 5, Light 1, Washing 2-3, Water 3

Dischargeability, good-very good

Bayer Co., BP 412/11; USP 1023120; FP 430526; GP 239533 (Fr. 10, 867)

FIAT 764 — Parabronze NG

Soluble in water (dark olive brown)

Slightly soluble in ethanol

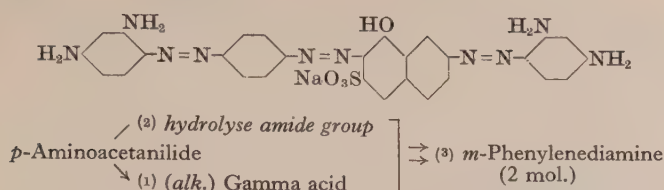
H₂SO₄ conc. — dark olive green; on dilution — weak olive brown

Aqueous solution + HCl conc. — olive brown, ppt;

+ NaOH conc. — reddish brown

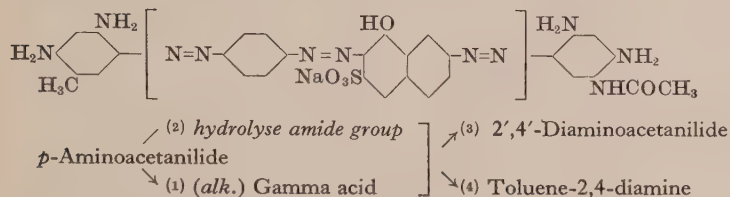
31535 Direct Dye**Styx Black (IG)**

FIAT 764 — Styxschwarz

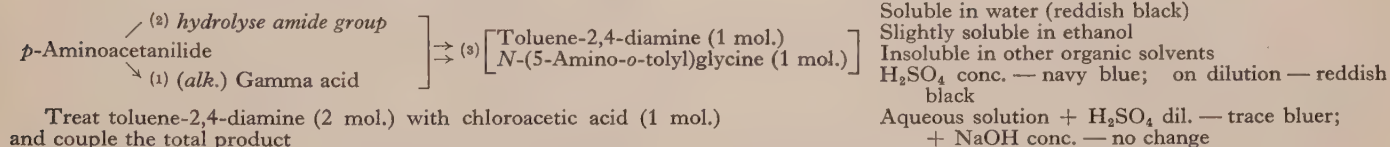
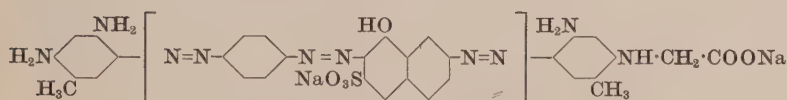
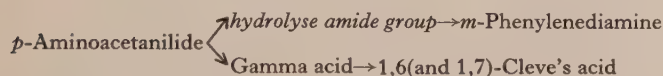
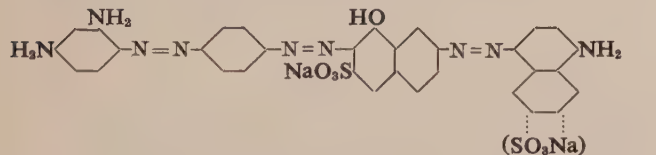
**31540 Direct Dye****Pluto Black TG Extra (IG)**

Fastness Properties (C): Acid 4, Alkali 5, Light 1-2, Washing 1-2, Water 2-3. Dischargeability, fairly good—good. Fastness to washing (3) and water (3-4) improved by after-treatment with formaldehyde.

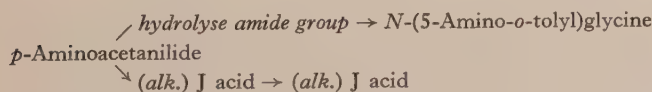
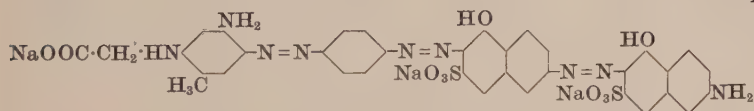
FIAT 764 — Plutoschwarz TG ex.

**31545 C.I. Direct Black 10 (Black)**

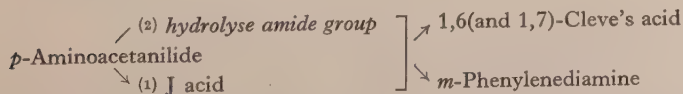
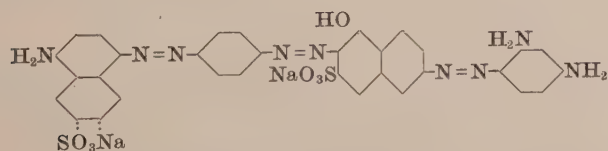
FIAT 764 — Plutoschwarz BS ex. "F"

**31546 C.I. Direct Black 141 (Black)****31550 Direct Dye****Union Black N (IG)**

FIAT 764 — Halbwollschwarz N "F"

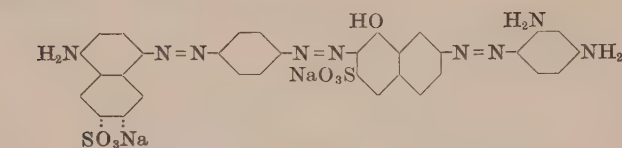
**31555 Direct Dye****Titan Black J (H)**

Of moderate fastness to washing and of good fastness to acid and alkali.



Soluble in water (violet black). H₂SO₄ conc. — dark green; on dilution — bluish black ppt. Aqueous solution + HCl — bluish black ppt; + NaOH — redder.

31560 C.I. Direct Black 9 (Black)



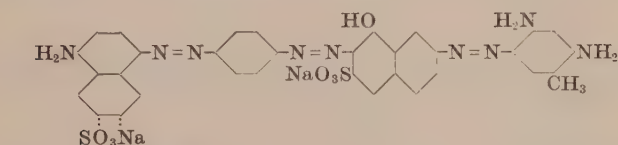
p -Nitroaniline $\xrightarrow{(1) \text{ 1,6(and 1,7)-Cleve's acid}}$
 $\xrightarrow{(2) \text{ reduce nitro group}}$ \rightarrow (3) (alk.) Gamma acid
 \rightarrow (4) *m*-Phenylenediamine

This constitution is given for Columbia Black FF ex. (FIAT 764) but the true constitution is uncertain, cf. Fierz-David where it is stated that at the diazotisation stage for (3) the amino group attached to the naphthylamine residue is the one diazotised

Discoverers — Clausius and Seidel; O. Ernst 1898
M.L.B., BP 12804/00; USP 679221; FP 302499; GP 131986, 131987 (Fr. 6, 1008, 1009)
FIAT 764 — Columbiaschwarz FF ex. Plutoschwarz A ex., FCW Fierz-David, 163-5

Soluble in water (reddish black)
Soluble in Cellosolve
Slightly soluble in ethanol
Insoluble in other organic solvents
H₂SO₄ conc. — dull blue to navy; on dilution — dull reddish blue to black
HNO₃ conc. — red solution
HCl conc. — slightly soluble (reddish grey)
Aqueous solution + conc. NaOH — trace redder

31565 C.I. Direct Black 9 (Black)



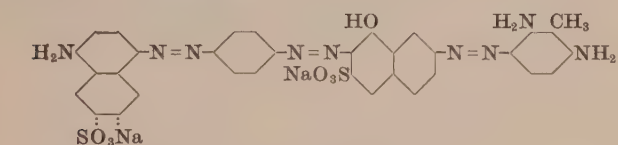
p -Nitroaniline $\xrightarrow{(1) \text{ 1,6(and 1,7)-Cleve's acid}}$
 $\xrightarrow{(2) \text{ reduce nitro group}}$ \rightarrow (3) Gamma acid
 \rightarrow (4) Toluene-2,4-diamine

(See note on C.I.31560)

Discoverers — Clausius and Seidel; O. Ernst 1898
M.L.B., BP 12804/00; USP 679221; FP 302499; GP 131986, 131987, (Fr. 6, 1008, 1009)
FIAT 764 — Columbiaschwarz FB ex., FBW

H₂SO₄ conc. — greenish grey; on dilution — bluish black ppt.
HNO₃ conc. — yellowish brown solution
Aqueous solution + HCl — dull bluish red;
+ NaOH — reddish blue ppt.

31570 Direct Dye



p -Nitroaniline $\xrightarrow{(1) \text{ 1,6(and 1,7)-Cleve's acid}}$
 $\xrightarrow{(2) \text{ reduce nitro group}}$ \rightarrow (3) (alk.) Gamma acid
 \rightarrow (4) Toluene-2,6-diamine

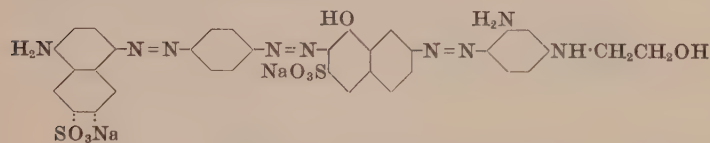
(See note on C.I.31560)

Discoverer — Bayer Co.
Pluto Black FW Extra Conc. (By)

For dyes of similar constitution —
M.L.B., BP 12804/00; USP 679221; FP 302499; GP 131986, 131987, (Fr. 6, 1008, 1009)

Soluble in water (violet black)
Slightly soluble in ethanol
H₂SO₄ conc. — dull bluish green; on dilution — dull violet
Aqueous solution + HCl conc. — bluish black, ppt;
+ NaOH conc. — bluish black, ppt.

31575 C.I. Direct Black 2 (Black)

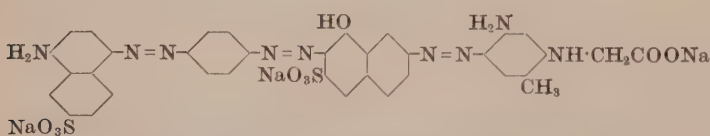


p -Aminoacetanilide $\xrightarrow{(1) \text{ 1,6(and 1,7)-Cleve's acid}}$
 $\xrightarrow{\text{hydrolyse amide group}}$ \rightarrow (alk.) Gamma acid
 \rightarrow 2-(*m*-Aminoanilino)ethanol

(See note on C.I.31560)

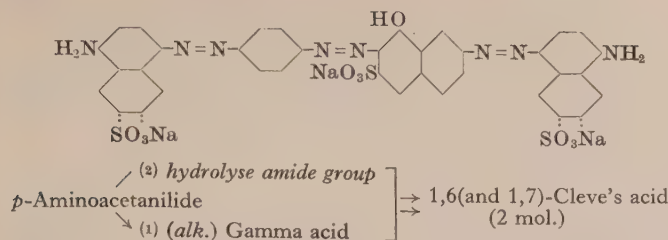
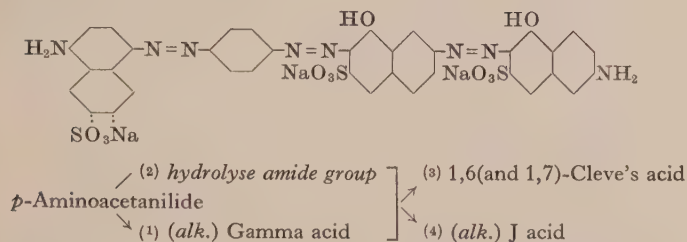
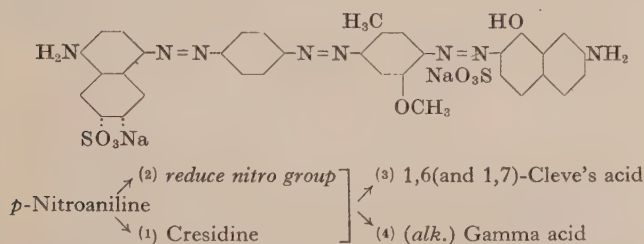
FIAT 764 — Plutoschwarz RB

31580 C.I. Direct Black 21 (Black)

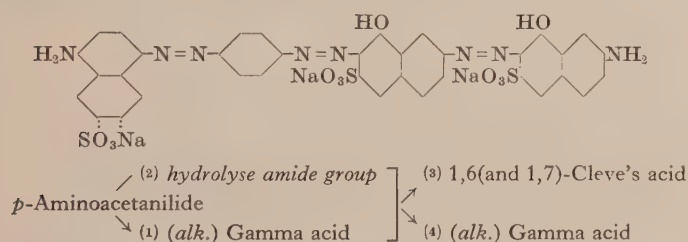


p -Aminoacetanilide $\xrightarrow{(2) \text{ hydrolyse amide group}}$ \rightarrow (3) 1,7-Cleve's acid
 $\xrightarrow{(1) \text{ (alk.) Gamma acid}}$ \rightarrow (4) *N*-(5-Amino-*o*-tolyl)glycine

Soluble in water (bluish black)
H₂SO₄ conc. — dark green
Aqueous solution + HCl — blue black ppt;
+ NaOH — redder

31585 Direct Dye
Diazo Dark Blue 3B (IG)
FIAT 764 — Diazodunkelblau 3B "F"

31590 Direct Dye
Zambesi Black 4B (IG)
FIAT 764 — Sambesischwarz 4B

31595 C.I. Direct Black 1 (Black)*
FIAT 764 — Sambesischwarz F


* Developed with toluene-2,4-diamine

31600 C.I. Direct Black 80 (Black)*
FIAT 764 — Oxydiaminogen OB


* Developed with toluene-2,4-diamine

Very soluble in water (blue black)
 Insoluble in organic solvents
 H_2SO_4 conc. — blue; on dilution — violet ppt.
 HNO_3 conc. — yellowish red solution
 HCl conc. — partial solution (violet)
 Aqueous solution + $NaOH$ 10% — reddish blue solution

31605 Direct Dye
Discoverers — C. Ris and C. Simon 1897

Isodiphenyl Black R (Gy)

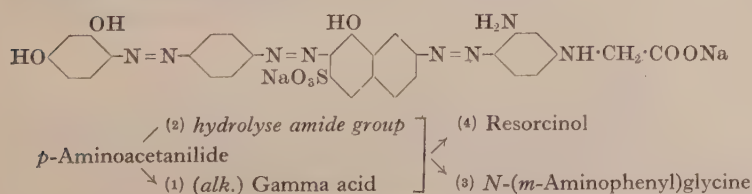
Fastness Properties: Acid and Alkali, good; Light, poor.
 Fastness to washing considerably improved by after-treatment with formaldehyde. It is the first dye for which this aftertreatment was recommended. Was used for dyeing unions from a single bath

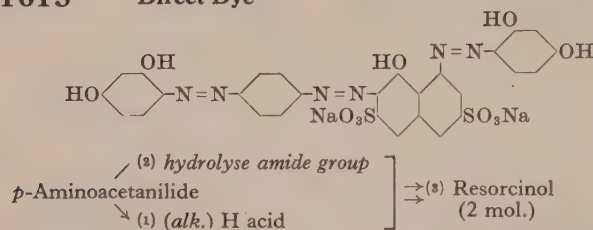
Geigy Co., *BP* 20278/97; *USP* 615497; *FP* 270151
Vlies, JSDC, 30 (1914), 105

Soluble in water and hot ethanol (violet black)
 H_2SO_4 conc. — blackish blue; on dilution — black ppt.
 Aqueous solution + HCl — bluish black ppt;
 + $NaOH$ — redder, black ppt.

31610 Direct Dye
Pluto Milling Black B (IG)

Fastness Properties (C): Acid 4, Alkali 5, Light 2,
 Washing 1-2, Water 2-3. Dischargeability, good—very good

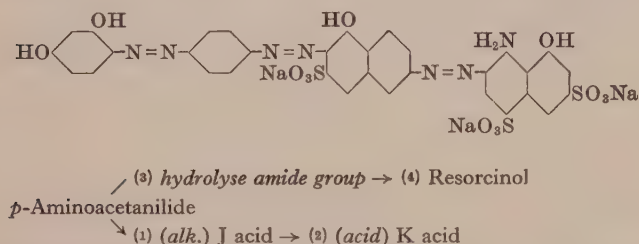
FIAT 764 — Plutowalkschwarz B


31615 Direct Dye


Discoverer — A. Blank 1910

Para Olive G (By) may be coupled with diazotised *p*-nitroaniline: Fastness Properties (C), coupled with diazotised *p*-nitroaniline: Acid (organic) 4, Alkali 5, Light 2, Washing 2-3, Water 3-4. Dischargeability, very good
 Bayer Co., BP 412/11; USP 1023120; FP 430526; GP 239533 (Fr. 10, 867)
 FIAT 764 — Paraoliv G

Moderately soluble in water

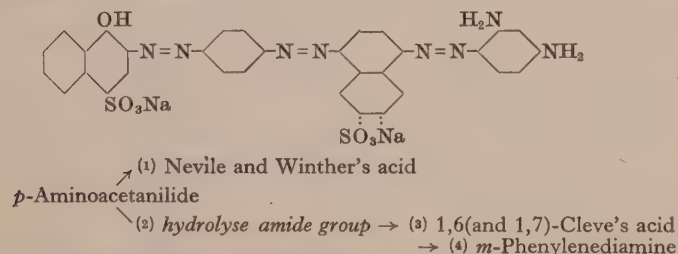
31620 Direct Dye


Discoverers — A. Blank and K. Heusner 1909

Para Black GG (By)

Fastness Properties, coupled with diazotised *p*-nitroaniline: Acid (organic), Ammonia, Light and Washing, good Dischargeability, good
 Bayer Co., BP 9620/10; USP 969450; FP 424405; GP 249628 (Fr. 10, 888)

Moderately soluble in water (dark violet)
 Slightly soluble in ethanol
 H₂SO₄ conc. — greenish blue; on dilution — dull violet
 Aqueous solution + HCl conc. — violet black, ppt;
 + NaOH conc. — dark blue

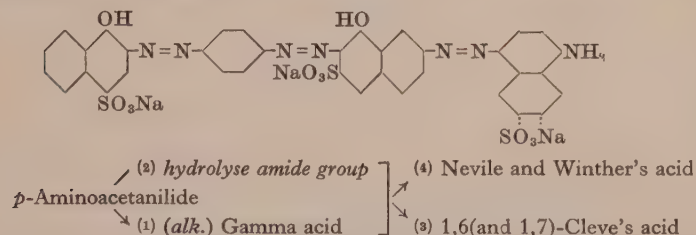
31625 Direct Dye


Discoverer — Badische Co.

Oxamine Dark Blue R (B)

Fastness Properties (C): Acid (organic) 3, Alkali 5, Light 2, Washing and Water 1-2
 FIAT 764 — Oxamindunkelblau R

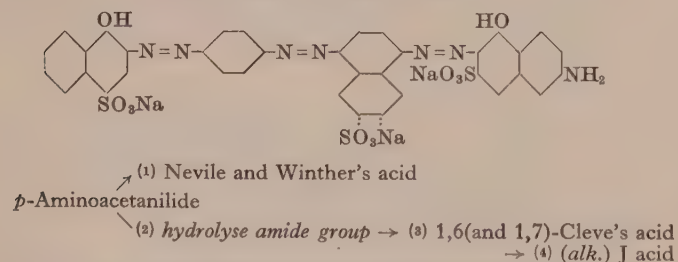
Soluble in water (violet to black)
 Slightly soluble in ethanol
 H₂SO₄ conc. — bluish green; on dilution — corinth
 Aqueous solution + HCl conc. — corinth ppt;
 + NaOH conc. — dark navy blue

31630 Direct Dye


Discoverer — Kalle Co. 1901

Naphthamine Blue GE (K) may be developed with 2-naphthol

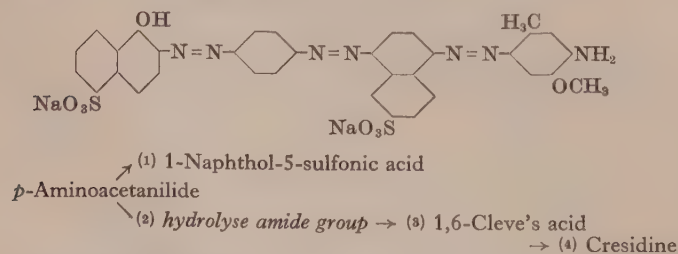
Soluble in water (dark blue)
 Insoluble in ethanol
 H₂SO₄ conc. — dark blue; on dilution — dullish violet
 Aqueous solution + HCl conc. — navy blue ppt;
 + NaOH conc. — dark navy blue

31635 C.I. Direct Blue 33 (Reddish navy)


Discoverer — Badische Co.

FIAT 764 — Oxamindunkelblau BG

Soluble in water (navy blue)
 Slightly soluble in ethanol
 H₂SO₄ conc. — dullish blue green; on dilution — violet
 Aqueous solution + HCl conc. — dullish violet ppt;
 + NaOH conc. — dark blue

31640 Direct Dye (Greenish navy)*


Discoverer — Agfa, Cassella Co. 1902

Naphthogen Blue B (A)

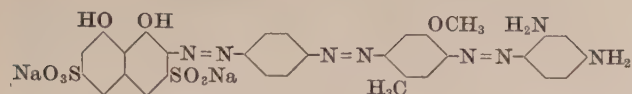
Fastness Properties (C): Developed with 2-naphthol, Acid (organic) and Alkali, very good; Light, fairly good; Washing, fairly good-good; Water, good Dischargeability: neutral, very good; alkaline, good-very good

FIAT 764 — Naphthogenblau B

Soluble in water (corinth) and ethanol (violet)
 H₂SO₄ conc. — dull bluish green; on dilution — bordeaux to corinth
 Aqueous solution + HCl conc. — dark violet ppt;
 + NaOH conc. — dark corinth ppt.

* Developed with 2-naphthol

31645 Direct Dye



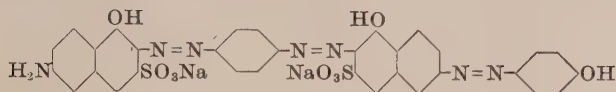
p-Nitroaniline
 (1) Chromotropic acid
 (2) reduce nitro group → (3) Cresidine → (4) *m*-Phenylenediamine

Discoverer — Agfa ca. 1910

Paranil Black BB (A) may be coupled with diazotised *p*-nitroaniline

FIAT 764 — Paranilschwarz BB

31650 Direct Dye



p-Aminoacetanilide
 (3) hydrolyse amide group → (4) (alk.) J acid
 (1) (alk.) J acid → (2) Phenol

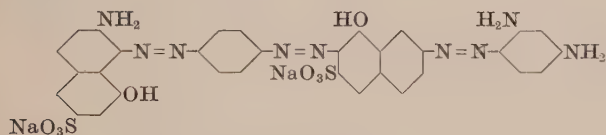
Discoverer — W. Bergdolt 1909

Para Black V (By) — Very similar in properties to C.I.31620 Bayer Co., *USP* 1014633

Moderately soluble in water (bluish black) and in ethanol (dullish violet)

H₂SO₄ conc. — deep blue; on dilution — dull bluish violet
 Aqueous solution + HCl conc. — greyish violet ppt;
 + NaOH conc. — violet black ppt.

31655 Direct Dye



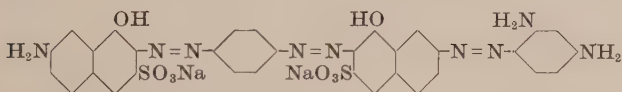
p-Nitroaniline
 (1) (acid) Gamma acid
 (2) reduce nitro group → (3) (alk.) Gamma acid
 → (4) *m*-Phenylenediamine

Cotton Black A4G (IG)

Fastness Properties (C): Acid 4, Alkali 5, Light 5, Washing 1, Water 2-3. Dischargeability, good

FIAT 764 — Baumwollschwarz A4G

31660 Direct Dye (Black)



p-Aminoacetanilide
 (2) hydrolyse amide group
 (1) (alk.) Gamma acid
 (3) (alk.) Gamma acid
 (4) *m*-Phenylenediamine

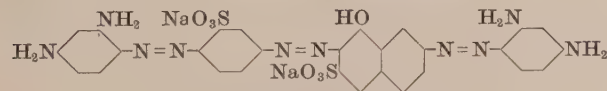
Discoverer — A. Weinberg 1894

Oxydiamine Black N (C)

Cassella Co., *USP* 526763

FIAT 764 — Oxydiaminschwarz 830 "F"

31665 C.I. Direct Black 36 (Greenish black)



p-Aminoacetanilide
 (2) sulfonate-(3) hydrolyse amide group
 (1) (alk.) Gamma acid
 (3) *m*-Phenylenediamine (2 mol.)

Discoverers — K. Krekeler and E. Martz 1896

Bayer Co., *USP* 603090

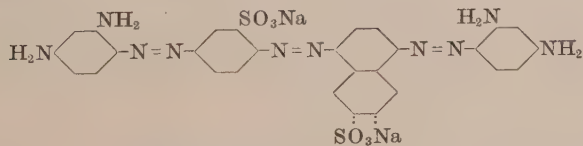
Moderately soluble in water (yellowish olive brown)

Very slightly soluble in ethanol

H₂SO₄ conc. — violet black; on dilution — weak brown

Aqueous solution + HCl conc. — brown

31670 Direct Dye

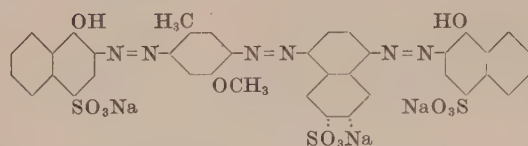


2-Amino-5-nitrobenzenesulfonic acid
 (2) reduce nitro group
 (1) 1,6(and 1,7)-Cleve's acid
 (3) *m*-Phenylenediamine (2 mol.)

Discoverers — K. Elbel and I. Rosenberg 1889

Kalle Co., *USP* 671543; *GP* 126671 (*Fr.* 6, 984)

The constitution shown is recorded as an example of the dyes covered by *GP* 126671 which has been associated with a number of Carbon Blacks and Naphthamine Direct Blacks marketed by Kalle & Co.

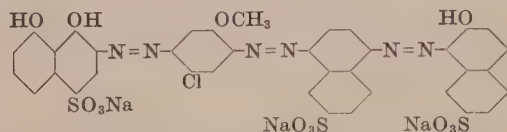
31675 Direct Dye

(3) reduce nitro group → (4) Neville and Winther's acid
 5-Methyl-4-nitro-*o*-anisidine
 (1) 1,6(and 1,7)-Cleve's acid → (2) Neville and Winther's acid

Diamine Fast Blue FFG (IG)

Fastness Properties (C): Acid 4, Alkali 5, Light 4, Washing and Water 1-2. Dischargeability: neutral and alkaline, very good

FIAT 764 — Diaminechtblau FFG

31680 C.I. Direct Blue 157 (Dull blue)*

(3) hydrolyse the oxamic acid group → (4) 4,5-Dihydroxy-1-naphthalenesulfonic acid
 4'-Amino-2'-chloro-5'-methoxyoxanilic acid
 (1) 1,6-Cleve's acid → (2) 2-Naphthol-7-sulfonic acid

* Coupled with diazotised *p*-nitroaniline

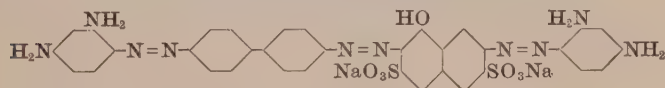
Discoverers — H. Jordan and W. Neelmeier 1910

Bayer Co., BP 27861/10; USP 1032412; FP 436174; GP 268488 (Fr. 11, 422)

FIAT 764 — Paralichtblau 6B

For coupling of 4,5-dihydroxy-1-naphthalenesulfonic acid see C.I.16530

Soluble in water (blue)
 Very slightly soluble in ethanol
 H₂SO₄ conc. — olive green; on dilution — blue
 Aqueous solution + HCl conc. — blue ppt;
 + NaOH conc. — dull blue

31685 C.I. Direct Brown 151 (Dull reddish brown)*

Benzidine
 (1) (alk.) 2R acid → (2) *m*-Phenylenediamine (2 mol.)

* Coupled with diazotised *p*-nitroaniline

Discoverers — W. A. Israel, A. Blank, and R. Kothe 1893

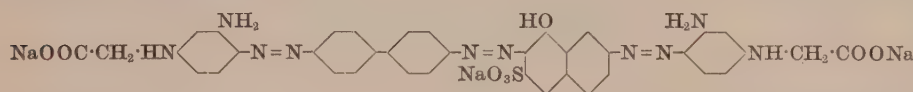
Bayer Co., GP ap. F 7258 (Fr. 5, 583)

FIAT 764 — Parabraun V

Slightly soluble in water (corinth)
 Very slightly soluble in ethanol
 H₂SO₄ conc. — dark blue; on dilution — brownish grey (black ppt.)
 Aqueous solution + HCl conc. — violet ppt;
 + NaOH conc. — bluish red to bordeaux

31690 Direct Dye

Discoverer — Bayer Co.



Benzidine
 (1) (alk.) Gamma acid → (2) *N*-(*m*-Aminophenyl)glycine (2 mol.)

Aqueous solution + HCl conc. — violet grey blue ppt;
 + NaOH conc. — wine red to bordeaux ppt.

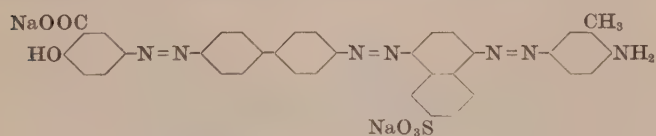
Benzo Chrome Brown CR (By)

Fastness Properties: Direct, Acid (organic), fairly good; Alkali, good; Light, poor; Washing and Water, fair. May be after-treated with potassium dichromate or chromium fluoride

Soluble in water (corinth)
 Slightly soluble in ethanol (pale violet brown)
 H₂SO₄ conc. — violet black (dark blue and corinth);
 on dilution — dull violet brown

31695 Direct Dye

Discoverer — Cassella Co. 1900



Benzidine
 (1) Salicylic acid
 (2) 1,6-Cleve's acid → (3) *o*-Toluidine

Diamine Brown R (C)

Fastness Properties (C): Acid (organic) 7, Alkali 3, Light 2, 3, Washing and Water 2. Dischargeability: neutral, fairly good; alkaline, fair

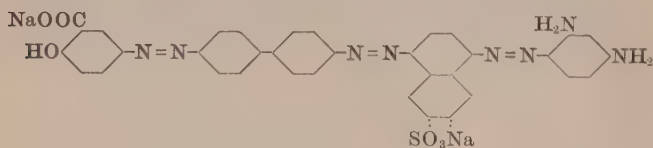
FIAT 764 — Diaminbraun R

Soluble in water (yellowish olive brown)
 Moderately soluble in ethanol (yellow brown)
 H₂SO₄ conc. — dark violet; on dilution — olive
 Aqueous solution + HCl conc. — olive ppt;
 + NaOH conc. — yellow brown

31700 C.I. Direct Brown 24 (Dull reddish brown)

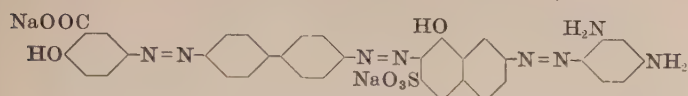
Discoverers — K. Krekeler and E. Martz 1896

Bayer Co., USP 603090



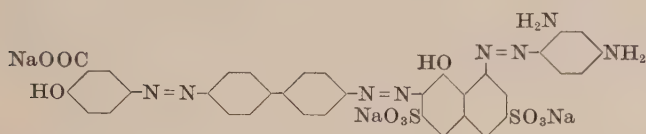
Benzidine
 (1) Salicylic acid
 (2) 1,6(and 1,7)-Cleve's acid → (3) *m*-Phenylenediamine

Soluble in water (brown)
 Moderately soluble in ethanol (corinth)
 H₂SO₄ conc. — dark blue; on dilution — olive brown
 Aqueous solution + HCl conc. — brown ppt;
 + NaOH conc. — orange brown ppt.

31705 C.I. Direct Brown 57 (Dull reddish brown)

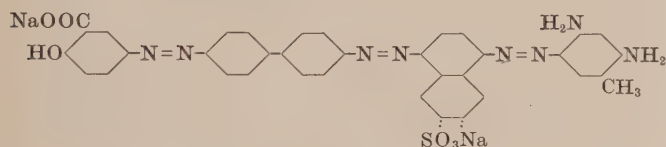
Benzidine \nearrow (1) Salicylic acid
 \searrow (2) (alk.) Gamma acid \rightarrow (3) *m*-Phenylenediamine

Soluble in water (dull reddish brown), ethanol and Cellosolve
 Slightly soluble in acetone
 Insoluble in other organic solvents
 H_2SO_4 conc. — dull bluish violet; on dilution — reddish brown ppt; H_2SO_4 10% — bluish grey
 Aqueous solution + NaOH 10% — bordeaux

31710 C.I. Direct Brown 51 (Brownish olive)

Benzidine \nearrow (1) Salicylic acid
 \searrow (2) (alk.) H acid \rightarrow (3) *m*-Phenylenediamine

Discoverers — M. Hoffmann and C. Krohn 1891
 Cassella Co., BP 6972/91; USP 514931; FP 201770; GP 75762
 (Fr. 4, 873)
 JSDC, 8 (1892), 166

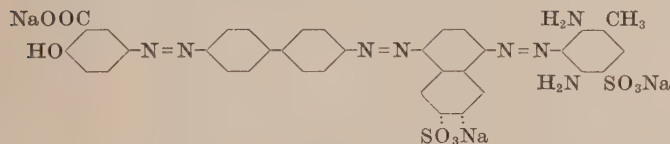
31715 Direct Dye

Benzidine \nearrow (1) Salicylic acid
 \searrow (2) 1,6(and 1,7)-Cleve's acid \rightarrow (3) Toluene-2,4-diamine

Chromanil Brown GG (By)

Dischargeability, fairly good
 FDX 885 — Chromanilbraun GG

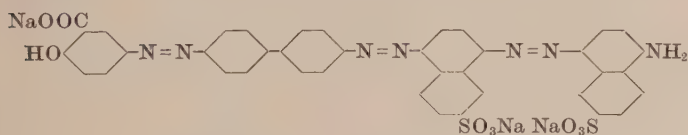
Slightly soluble in water (yellowish olive brown)
 Very slightly soluble in ethanol
 H_2SO_4 conc. — violet black (+ magenta and dark blue);
 on dilution — pale brown
 Aqueous solution + HCl conc. — brown;
 + NaOH conc. — orange brown

31720 C.I. Direct Brown 62 (Reddish brown)

Benzidine \nearrow (1) Salicylic acid
 \searrow (2) 1,6(and 1,7)-Cleve's acid
 \rightarrow (3) 4,6-Diamino-*m*-toluenesulfonic acid

Discoverers — K. Krekeler and E. Martz 1896
 Bayer Co., USP 603090
 FIAT 764 — Benzochrombraun R

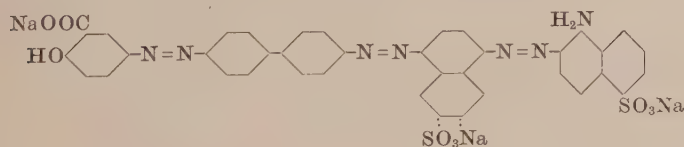
Soluble in water (orange brown)
 Slightly soluble in ethanol
 H_2SO_4 conc. — dark blue; on dilution — weak brown
 Aqueous solution + HCl conc. — brown ppt;
 + NaOH conc. — orange brown, ppt.

31725 C.I. Direct Brown 27 (Dull reddish brown)

Benzidine \nearrow (1) Salicylic acid
 \searrow (2) 1,7-Cleve's acid \rightarrow (3) 1,6-Cleve's acid

Discoverers — K. Krekeler and E. Martz 1896
 Bayer Co., USP 603648
 FIAT 764 — Benzochrombraun B
 BIOS 1548, 186

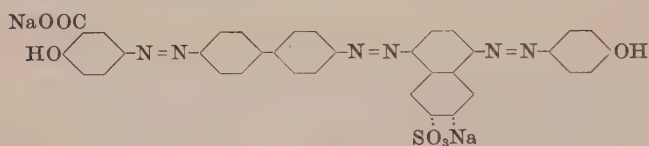
Soluble in water (brown)
 Very slightly soluble in ethanol (pale corinth)
 H_2SO_4 conc. — blue to blue black; on dilution — pale olive green ppt.
 Aqueous solution + HCl conc. — olive green ppt;
 + NaOH conc. — orange brown ppt.

31730 C.I. Direct Brown 26 (Dull reddish brown)

Benzidine \nearrow (1) Salicylic acid
 \searrow (2) 1,6(and 1,7)-Cleve's acid
 \rightarrow (3) 5-Amino-1-naphthalenesulfonic acid

Discoverer — R. Lauch (Bayer Co.) 1892
 Cassella Co., GP ap. C 3949 (Fr. 3, 685)
 FIAT 764 — Benzodunkelbraun ex.

Soluble in water (olive brown)
 Moderately soluble in ethanol (brownish yellow)
 H_2SO_4 conc. — dark violet (+ blue); on dilution — dull bluish green to pale olive brown ppt.
 Aqueous solution + HCl conc. — brownish olive ppt;
 + NaOH conc. — orange brown ppt.

31735 C.I. Direct Brown 54 (Brown)

Benzidine \nearrow (1) Salicylic acid
 \searrow (2) 1,6(and 1,7)-Cleve's acid \rightarrow (3) Phenol

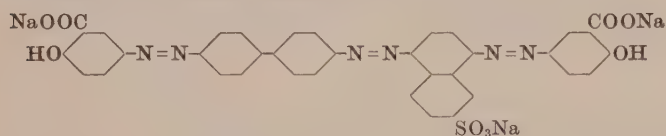
Discoverer — Cassella Co. 1891

Cassella Co., BP 2789/92; FP 219567; GP ap. C 3949 (Fr. 3, 685)

FIAT 764 — Dianilchrombraun G

Soluble in water (yellowish brown)

Moderately soluble in ethanol (yellowish brown to olive)

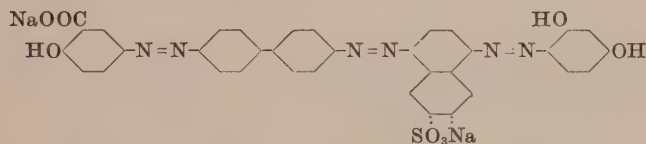
 H_2SO_4 conc. — dark blue to blue black; on dilution — pale olive to yellow brownAqueous solution + HCl conc. — olive to yellow brown;
+ NaOH conc. — orange brown**31740 C.I. Direct Brown 101 (Brown)**

Benzidine \nearrow (1) Salicylic acid
 \searrow (2) 1,7-Cleve's acid \rightarrow (3) Salicylic acid

Discoverers — K. Krekeler and E. Martz 1896

FIAT 764 — Benzochrombraun G, Eukanolbrillantbraun O
FIAT 1313; 3, 186

Soluble in water (orange brown) and ethanol (golden orange)

 H_2SO_4 conc. — dark blue; on dilution — pale olive brownAqueous solution + HCl conc. — olive brown ppt;
+ NaOH conc. — reddish orange brown ppt.**31745 Direct Dye**

Benzidine \nearrow (1) Salicylic acid
 \searrow (2) 1,6(and 1,7)-Cleve's acid \rightarrow (3) Resorcinol

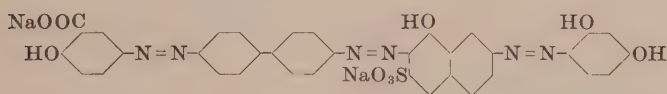
Discoverer — Bayer Co. 1898

Benzo Chrome Brown 3R (By)

Fastness Properties, direct: Acid (organic) Alkali and Light, fair; Washing, poor-fair; Water, fair. May be aftertreated with potassium dichromate or chromium fluoride

Soluble in water (yellowish orange brown)

Slightly soluble in ethanol (brownish olive yellow)

 H_2SO_4 conc. — dark blue (+ reddish violet); on dilution — pale brownish olive yellowAqueous solution + HCl conc. — olive brown ppt;
+ NaOH conc. — orange brown ppt.**31750 C.I. Direct Brown 190 (Reddish brown)**

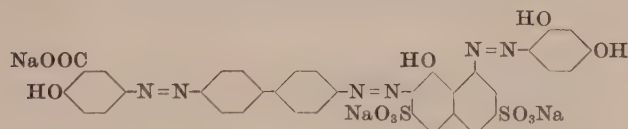
Benzidine \nearrow (1) Salicylic acid
 \searrow (2) (alk.) Gamma acid \rightarrow (3) Resorcinol

Soluble in water, ethanol and Cellosolve

Insoluble in other organic solvents

 H_2SO_4 conc. — dull reddish blue; on dilution — reddish brown solution and ppt. H_2SO_4 10% — pale bluish bordeaux

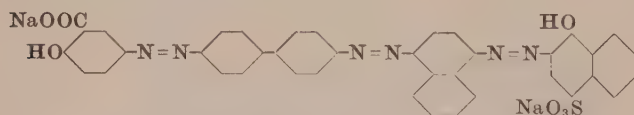
Aqueous solution + NaOH conc. — bluish bordeaux

31755 C.I. Direct Brown 159 (Brownish olive)*

Benzidine \nearrow (1) Salicylic acid
 \searrow (2) (alk.) H acid \rightarrow (3) Resorcinol

* Coupled with diazotised *p*-nitroaniline

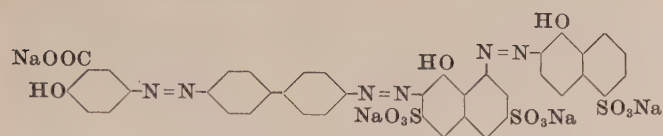
Soluble in water (brown)

 H_2SO_4 conc. — brownish violet; on dilution — clear reddish brownAqueous solution + HCl conc. — brown ppt;
+ NaOH conc. — brown**31760 C.I. Direct Black 40 (Grey)**

Benzidine \nearrow (1) Salicylic acid
 \searrow (2) 1-Naphthylamine \rightarrow (3) Neville and Winther's acid

Discoverer — R. Lauch 1890

Bayer Co., BP 13235/90; FP 187365; GP 57331 (Fr. 3, 652)

31765 Direct Dye

Benzidine $\begin{cases} \nearrow (1) \text{ Salicylic acid} \\ \searrow (2) \text{ (alk.) H acid} \rightarrow (3) \text{ 1-Naphthol-5-sulfonic acid} \end{cases}$

Discoverer — Cassella Co. 1891

Diamine Catechine BNF (C)

Cassella Co., *BP* 6972/91; *USP* 514931; *GP* 75762 (*Fr.* 4, 873)
FIAT 764 — Diaminkatechin BNF

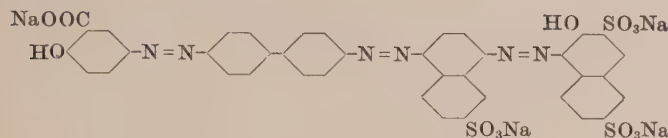
Soluble in water (olive brown)

Insoluble in ethanol

H_2SO_4 conc. — violet black; on dilution — olive

Aqueous solution + HCl conc. — olive brown ppt;

+ NaOH conc. — orange brown

31770 Direct Dye

Benzidine $\begin{cases} \nearrow (1) \text{ Salicylic acid} \\ \searrow (2) \text{ 1,7-Cleve's acid} \rightarrow (3) \text{ R acid} \end{cases}$

Discoverer — R. Lauch 1891

Benzo Grey S Extra (By)

Fastness Properties: Acid and Alkali, good; Light and Washing, moderate

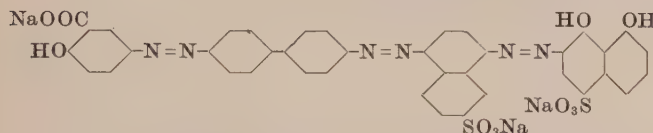
Bayer Co., *BP* 3439/91; *USP* 476393, 479515, 503148; *FP* 187365;
GP 61950 (*Fr.* 3, 654)

Soluble in water (greyish black)

Insoluble in ethanol

H_2SO_4 conc. — bluish grey; on dilution — pale greenish blue to grey

Aqueous solution + HCl conc. — dark greenish blue to grey ppt;
+ NaOH conc. — dark brown, ppt.

31775 C.I. Direct Green 22 (Dull green \rightarrow Olive)

Benzidine $\begin{cases} \nearrow (1) \text{ Salicylic acid} \\ \searrow (2) \text{ 1,7-Cleve's acid} \\ \rightarrow (3) \text{ 4,5-Dihydroxy-1-naphthalenesulfonic acid} \end{cases}$

Discoverers — K. Krekeler, E. Martz, and W. A. Israel 1891

Bayer Co., *BP* 22641/91; *USP* 603647; *FP* 213971, 221233;
GP 65262 (*Fr.* 3, 769)

FIAT 764 — Benzoooliv

For coupling of 4,5-dihydroxy-1-naphthalenesulfonic acid *see* C.I.16530

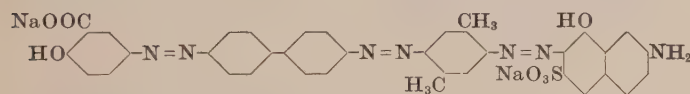
Soluble in water (olive green)

Moderately soluble in ethanol (lime green)

H_2SO_4 conc. — violet black; on dilution — pale greyish green

Aqueous solution + HCl conc. — olive;

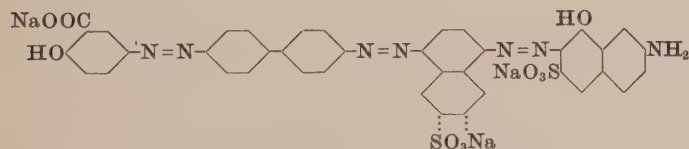
+ NaOH conc. — olive brown

31780 Direct Dye

Benzidine $\begin{cases} \nearrow (1) \text{ Salicylic acid} \\ \searrow (2) \text{ 2,5-Xylidine} \rightarrow (3) \text{ (alk.) Gamma acid} \end{cases}$

Crumpsall Direct Fast Brown B (Lev)

Discharged to creamy white by hydrosulfite on cotton
JSDC, 13 (1897), 111

31785 C.I. Direct Brown 46 (Dull brownish olive)

Benzidine $\begin{cases} \nearrow (1) \text{ Salicylic acid} \\ \searrow (2) \text{ 1,6(and 1,7)-Cleve's acid} \rightarrow (3) \text{ (alk.) Gamma acid} \end{cases}$

Discoverer — R. Lauch 1891

Bayer Co., *BP* 3439/91; *USP* 476393, 479515, 503148; *GP* 61950
(*Fr.* 3, 654)

BIOS 1548, 187; *FIAT* 764 — Columbiabronce B

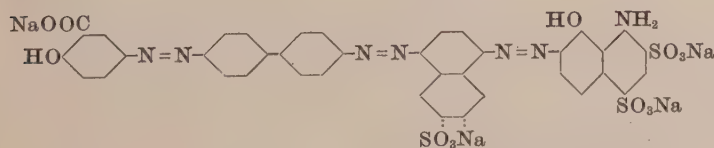
Soluble in water (brownish olive)

Very slightly soluble in ethanol

H_2SO_4 conc. — navy blue (+ blue); on dilution — pale olive grey

Aqueous solution + HCl conc. — greyish violet ppt;

+ NaOH conc. — orange brown ppt.

31790 C.I. Direct Green 21 (Dull green)

Benzidine $\begin{cases} \nearrow (1) \text{ Salicylic acid} \\ \searrow (2) \text{ 1,6(and 1,7)-Cleve's acid} \rightarrow (3) \text{ (alk.) Chicago acid} \end{cases}$

Soluble in water (dull green)

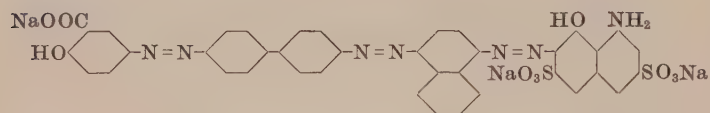
Slightly soluble in Cellosolve

Insoluble in other organic solvents

H_2SO_4 conc. — dull reddish blue; on dilution — dull bluish green solution and ppt.

Aqueous solution + NaOH 10% — pale reddish brown

31793 Direct Dye



Benzidine $\begin{cases} \nearrow (1) \text{ Salicylic acid} \\ \searrow (2) \text{ 1-Naphthylamine} \rightarrow (3) \text{ (alk.) H acid} \end{cases}$

Discoverers — R. Lauch, M. Ulrich, and C. Duisberg 1891

Benzo Olive (By)

Bayer Co., *BP* 3439/91; *USP* 476393; *FP* 187365; *GP* 65480 (*Fr.* 3, 657)

Benzo Olive (IG) had the constitution shown under C.I.31775 (C.I. Direct Green 22)

Soluble in water (dark moss green)

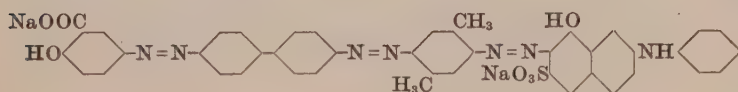
Insoluble in ethanol

H₂SO₄ conc. — violet; on dilution — greenish black ppt.

Aqueous solution + HCl conc. — blackish grey ppt;

+ NaOH conc. — dark brown solution

31795 Direct Dye



Benzidine $\begin{cases} \nearrow (1) \text{ Salicylic acid} \\ \searrow (2) \text{ 2,5-Xylydine} \rightarrow (3) \text{ (alk.) N-Phenyl Gamma acid} \end{cases}$

Discoverers — I. Levinstein and C. Mensching 1895

Crumpsall Direct Fast Brown O (Lev)

Levinstein Ltd., *BP* 20548/95; 23523/95; *USP* 622961; *FP* 260210

JSDC, 13 (1897), 111

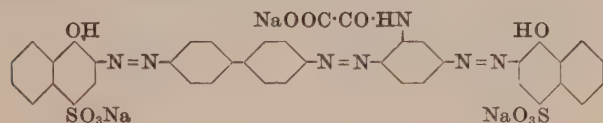
Soluble in water (brown)

H₂SO₄ conc. — violet; on dilution — brown ppt.

Aqueous solution + HCl conc. — brown ppt;

+ NaOH conc. — unaltered

31800 Direct Dye



Benzidine $\begin{cases} \nearrow (1) \text{ m-Aminooxanilic acid} \rightarrow \\ \searrow (2) \text{ 2,5-Xylydine} \rightarrow (3) \text{ (alk.) N-Phenyl Gamma acid} \end{cases}$

Discoverer — Markfeldt 1894

Oxamine Violet RR (R)

Remy, *BP* 22114/95; *FP* 252140; *GP* 86791 (*Fr.* 4, 961)

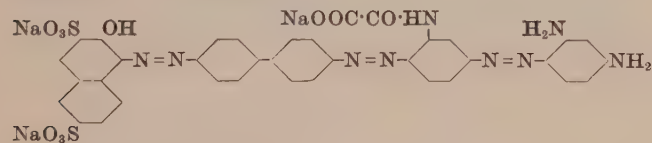
Soluble in water (bluish red) and ethanol

H₂SO₄ conc. — blue; on dilution — violet ppt.

Aqueous solution + HCl conc. — bluish red ppt;

+ NaOH conc. — violet red

31805 Direct Dye



Benzidine $\begin{cases} \nearrow (1) \text{ R acid} \\ \searrow (2) \text{ m-Aminooxanilic acid} \rightarrow (3) \text{ m-Phenylenediamine} \end{cases}$

Discoverer — Markfeldt 1894

Oxamine Violet GRF (R)

Remy, *BP* 22114/95; *FP* 252140; *GP* 86791 (*Fr.* 4, 961)

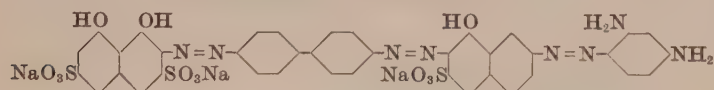
Soluble in water

H₂SO₄ conc. — blue; on dilution — violet ppt.

Aqueous solution + HCl conc. — reddish violet ppt;

+ NaOH conc. — cherry red

31810 C.I. Direct Black 27 (Bluish black)



Benzidine $\begin{cases} \nearrow (1) \text{ Chromotropic acid} \\ \searrow (2) \text{ (alk.) Gamma acid} \rightarrow (3) \text{ m-Phenylenediamine} \end{cases}$

Discoverer — M.L.B. 1895

Cassella Co., *FP* 247050; *GP* 104366 (*Fr.* 5, 572)

FIAT 764 — Dianilschwarz CR

Moderately soluble in water (dark navy blue)

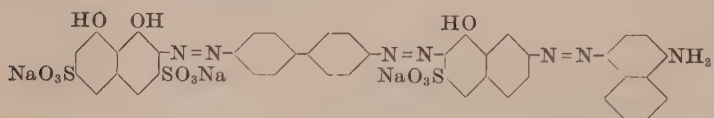
Insoluble in ethanol

H₂SO₄ conc. — turquoise blue; on dilution — dullish violet

Aqueous solution + HCl conc. — dark blue ppt;

+ NaOH conc. — violet

31815 Direct Dye



Benzidine $\begin{cases} \nearrow (1) \text{ Chromotropic acid} \\ \searrow (2) \text{ (alk.) Gamma acid} \rightarrow (3) \text{ 1-Naphthylamine} \end{cases}$

Discoverer — M.L.B. 1892

Dianil Dark Blue R (MLB) — May be developed with 2-naphthol or coupled with diazotised *p*-nitroaniline. Light fastness improved by aftertreatment with copper sulfate

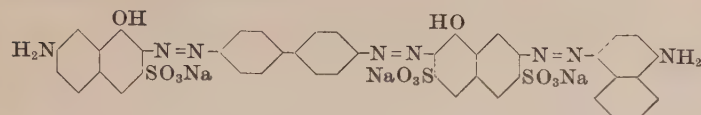
Soluble in water (violet black)

Insoluble in ethanol

H₂SO₄ conc. — deep blue; on dilution — violet

Aqueous solution + HCl conc. — dark blue ppt;

+ NaOH conc. — dullish dark violet ppt.

31820 Direct Dye

Benzidine $\begin{cases} \nearrow (2) (alk.) \text{ Gamma acid} \\ \searrow (1) (alk.) [2R \text{ acid} \rightarrow 1\text{-Naphthylamine}] \end{cases}$

Discoverer — M. Böniger 1896**Direct Black V (S)**

Direct, violet black, developed with 2-naphthol, dark blue, with toluene-2,4-diamine, black

Sandoz, *BP* 15294/96; *USP* 601033; *FP* 256950; *GP* 109161 (*Fr.* 5, 574)

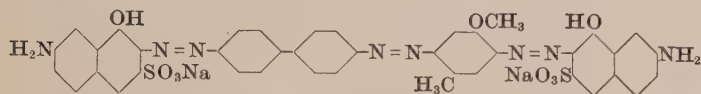
Soluble in water (violet black)

Insoluble in ethanol

H₂SO₄ conc. — blue; on dilution — blue black ppt.

Aqueous solution + HCl conc. — bluish black ppt;

+ NaOH conc. — reddish violet

31825 Direct Dye

Benzidine $\begin{cases} \nearrow (2) (alk.) \text{ Gamma acid} \\ \searrow (1) \text{ Cresidine} \rightarrow \end{cases} \left. \begin{matrix} \\ \\ \end{matrix} \right] (2 \text{ mol.})$

Discoverer — J. Schmidt 1893**Direct Indigo Blue BK (SCI)**

Direct, indigo blue, developed with 2-naphthol or toluene-2,4-diamine, black. Dischargeability, very good

Ciba, *USP* 557438; *FP* 233901; *GP* 83244 (*Fr.* 4, 972)

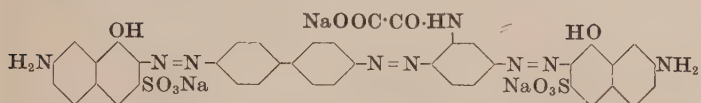
Soluble in water (violet)

Insoluble in ethanol

H₂SO₄ conc. — blue; on dilution — violet ppt.

Aqueous solution + HCl conc. — violet ppt;

+ NaOH conc. — reddish violet

31830 Direct Dye

Benzidine $\begin{cases} \nearrow (2) (alk.) \text{ Gamma acid} \\ \searrow (1) m\text{-Aminooxanilic acid} \rightarrow \end{cases} \left. \begin{matrix} \\ \\ \end{matrix} \right] (2 \text{ mol.})$

Discoverer — Markfeldt 1894

Oxamine Black MB (R) may be developed with toluene-2,4-diamine

Remy, *BP* 22114/95; *FP* 252140; *GP* 86791 (*Fr.* 4, 961)

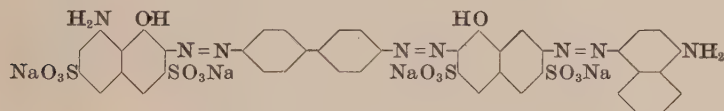
Soluble in water

Very slightly soluble in ethanol

H₂SO₄ conc. — pure blue; on dilution — reddish violet ppt.

Aqueous solution + HCl conc. — blackish blue ppt;

+ NaOH conc. — violet black ppt.

31835 Direct Dye

Benzidine $\begin{cases} \nearrow (2) (alk.) \text{ H acid} \\ \searrow (1) (alk.) [2R \text{ acid} \rightarrow 1\text{-Naphthylamine}] \end{cases}$

Discoverer — M. Böniger 1896**Direct Indone Blue R (S)**

Direct, dull blue, developed with 2-naphthol or toluene-2,4-diamine, black

Sandoz, *BP* 15294/96; *USP* 601033; *FP* 256950; *GP* 109161 (*Fr.* 5, 574)

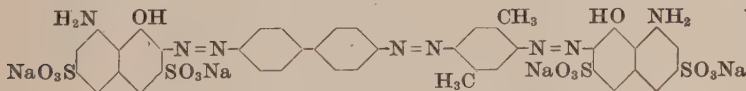
Soluble in water (bluish black)

Insoluble in ethanol

H₂SO₄ conc. — blue; on dilution — dark blue ppt.

Aqueous solution + HCl conc. — dark blue ppt;

+ NaOH conc. — violet

31840 Direct Dye

Benzidine $\begin{cases} \nearrow (2) (alk.) \text{ H acid} \\ \searrow (1) 2,5\text{-Xyldine} \rightarrow \end{cases} \left. \begin{matrix} \\ \\ \end{matrix} \right] (2 \text{ mol.})$

Discoverer — M. Böniger**Melogene Blue BH (S)**

Direct, blue black, developed with 2-naphthol, black, with *m*-phenylenediamine, brownish black, with resorcinol, dark green

Sandoz, *BP* 28810/98; *USP* 591616; *FP* 262109

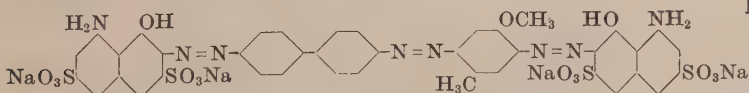
Soluble in water (bluish violet)

Insoluble in ethanol

H₂SO₄ conc. — blue; on dilution — bluish violet ppt.

Aqueous solution + HCl conc. — violet ppt;

+ NaOH conc. — violet

31845 Direct Dye

Benzidine $\begin{cases} \nearrow (2) (alk.) \text{ H acid} \\ \searrow (1) \text{ Cresidine} \rightarrow \end{cases} \left. \begin{matrix} \\ \\ \end{matrix} \right] (2 \text{ mol.})$

Discoverer — J. Schmidt 1893**Direct Indigo Blue A (SCI)**

Direct, indigo blue, moderately fast to Acid, Alkali, Light and Washing. Developed with 2-naphthol or toluene-2,4-diamine, black. Dischargeability, very good

Ciba, *USP* 557438; *FP* 233901; *GP* 83244 (*Fr.* 4, 972)

Soluble in water (blue)

Insoluble in ethanol

H₂SO₄ conc. — blue; on dilution — blue solution and ppt.

Aqueous solution + HCl conc. — blue ppt;

+ NaOH conc. — blue ppt.

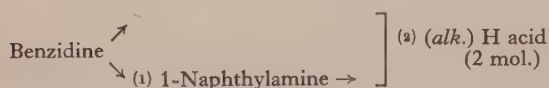
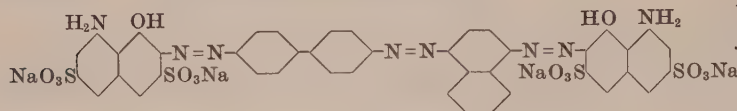
31850 C.I. Direct Black 83 (Reddish black)*

Discoverers — M. Ulrich and J. Bammann 1891

Bayer Co., BP 13443/90; USP 482106; FP 210033; GP 82597

(Fr. 4, 934)

JSDC, 9 (1893), 34



* Developed with toluene-2,4-diamine

Soluble in water (blue black)

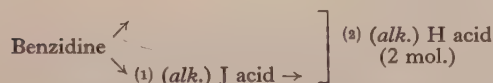
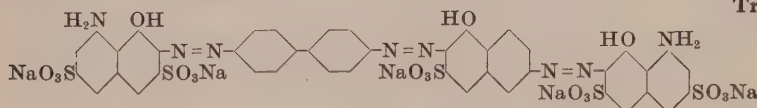
Slightly soluble in ethanol (bluish grey)

 H_2SO_4 conc. — dull greenish blue; on dilution — dark blue to violet ppt.Aqueous solution + HCl conc. — bluish black to dark blue ppt.
+ NaOH conc. — bluish black to dark blue**31855 Direct Dye**

Discoverer — Oehler

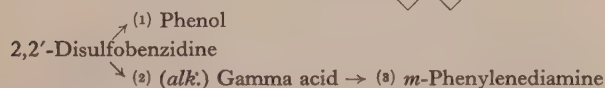
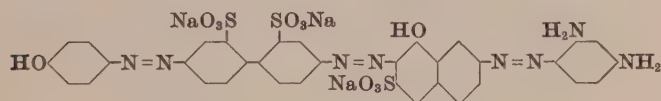
Triazol Blue BB (By)

Fastness Properties (C): Acid (organic) 4-5, Alkali 5, Light 2, Washing and Water 1-2



Soluble in water (dark blue)

Slightly soluble in ethanol (pale greyish violet)

 H_2SO_4 conc. — blue; on dilution — violetAqueous solution + HCl conc. — navy blue ppt;
+ NaOH conc. — navy blue**31860 C.I. Direct Brown 93 (Reddish brown)***

* On leather

Soluble in water (brown)

 H_2SO_4 conc. — brownish red; on dilution — brownish red ppt.Aqueous solution + HCl conc. — reddish brown ppt;
+ NaOH conc. — brownish red**31865 Direct Dye**

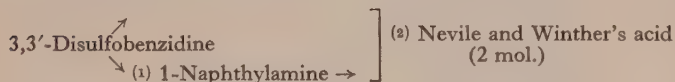
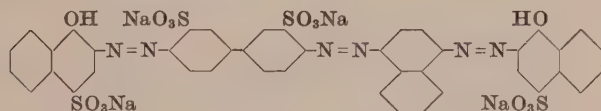
Discoverers — R. Lauch and M. Kahn 1887

Benzo Black Blue G (By)Of moderate fastness to Acid, Alkali, Light and Washing
Dischargeability, very good

Bayer Co., BP 16484/87; GP 44779 (Fr. 2, 405)

Griess, Ber. 14 (1881), 300

Griess & Duisberg, Ber. 22 (1889), 2463



Soluble in water (bluish black)

Insoluble in ethanol

 H_2SO_4 conc. — blackish green; on dilution — bluish black ppt.Aqueous solution + HCl conc. — blackish blue ppt;
+ NaOH conc. — blackish blue ppt.**31870 Direct Dye**

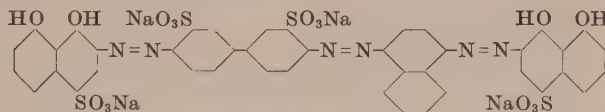
Discoverers — M. Kahn, R. Lauch, and M. Ulrich 1892

Benzo Black Blue 5G (By)

Fastness Properties: Acid, moderate; Alkali, poor; Light and Washing, moderate

Bayer Co., BP 16484/87; GP 44779 (Fr. 2, 405)

For coupling of 4,5-dihydroxy-1-naphthalenesulfonic acid see C.I.16530

 H_2SO_4 conc. — blackish green; on dilution — dark greenish blue ppt.

Aqueous solution + HCl conc. — dark greenish blue ppt.

Griess & Duisberg, Ber. 22 (1880), 2463

JSDC, 8 (1892), 146

Soluble in water (blackish blue)

Insoluble in ethanol

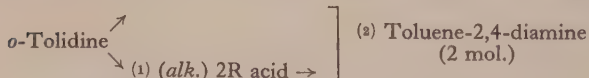
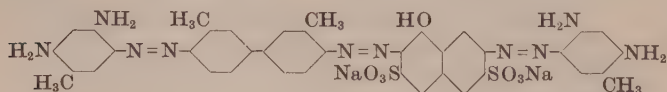
31875 Direct Dye

Discoverer — R. Kirchhoff 1893

Columbia Black R (A)

Fastness Properties: Acid and Alkali, very good; Light, fairly good; Washing, fair

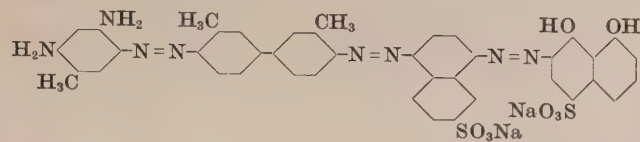
Agfa, BP 14895/93; USP 516604; FP 231976; GP 108215 (Fr. 5, 564)



Soluble in water and ethanol (brownish black)

 H_2SO_4 conc. — blue; on dilution — violet black ppt.Aqueous solution + HCl conc. — black ppt;
+ NaOH conc. — brown

31880 Direct Dye*



o-Tolidine \nearrow (1) 1,7-Cleve's acid \rightarrow (2) 4,5-Dihydroxy-1-naphthalenesulfonic acid
 \searrow (3) Toluene-2,4-diamine

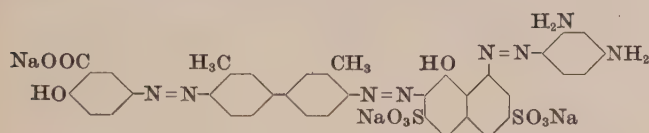
* **Benzo Chrome Black G (FBy)** — Is used only in the production of mixtures. May be aftertreated with dichromate and copper sulfate

Discoverers — K. Krekeler, W. A. Israel, and A. Blank 1898
 Bayer Co., *USP* 602857
FIAT 764 — Benzochromschwarz G

Moderately soluble in water (violet black) and ethanol (yellowish olive)
 H_2SO_4 conc. — dark blue (+ reddish violet); on dilution — pale dullish violet

Aqueous solution + HCl conc. — dull violet, ppt;
 + NaOH conc. — dull violet, ppt.

31885 C.I. Direct Brown 52 (Brownish olive)

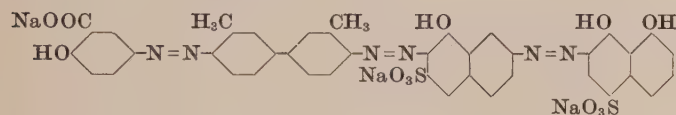


o-Tolidine \nearrow (1) Salicylic acid
 \searrow (2) (alk.) H acid \rightarrow (3) *m*-Phenylenediamine

Discoverers — M. Hoffmann and C. Krohn 1891
 Cassella Co., *BP* 6972/91; *USP* 514931; *FP* 201770; *GP* 75762
 (Fr. 4, 873)
FIAT 764 — Diaminbronce G

Soluble in water (olive brown)
 Moderately soluble in ethanol
 H_2SO_4 conc. — dark reddish blue to violet; on dilution — olive
 Aqueous solution + HCl conc. — dark brown ppt;
 + H_2SO_4 10% — slightly redder
 + NaOH conc. — yellow brown ppt.

31890 Direct Dye*



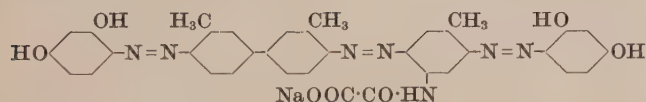
o-Tolidine \nearrow (1) Salicylic acid
 \searrow (2) (alk.) Gamma acid
 \rightarrow (3) 4,5-Dihydroxy-1-naphthalenesulfonic acid

* **Diamineral Black D (By)** — Is used only in the production of mixtures

Discoverer — Cassella Co.
FIAT 764 — Diamineralschwarz D

Soluble in water (grey black)
 Very slightly soluble in ethanol (pale dullish violet)
 H_2SO_4 conc. — dark blue to navy blue; on dilution — dullish violet
 Aqueous solution + HCl conc. — violet grey, ppt;
 + NaOH conc. — dark reddish brown

31895 Direct Dye

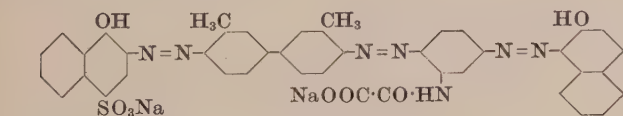


o-Tolidine \nearrow (1) 3-Amino-4-methyloxanilic acid \rightarrow (2) Resorcinol (2 mol.)

Discoverer — Markfeldt 1894
Oxamine Red MT (R)
 Remy, *BP* 22114/95; *FP* 252140; *GP* 86791 (Fr. 4, 961)

Soluble in water (brownish red)
 Very slightly soluble in ethanol
 H_2SO_4 conc. — blue; on dilution — reddish brown ppt.
 Aqueous solution + HCl conc. — reddish brown ppt;
 + NaOH conc. — redder solution

31900 Direct Dye

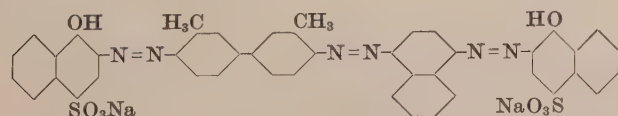


o-Tolidine \nearrow (1) Neville and Winther's acid
 \searrow (2) *m*-Aminooxanilic acid \rightarrow (3) 2-Naphthol

Discoverer — Markfeldt 1894
Oxamine Violet BRR (R)
 Remy, *BP* 22114/95; *FP* 252140; *GP* 86791 (Fr. 4, 961)

Soluble in water
 H_2SO_4 conc. — blue; on dilution — violet ppt.
 Aqueous solution + HCl conc. — bluish red ppt;
 + NaOH conc. — violet red

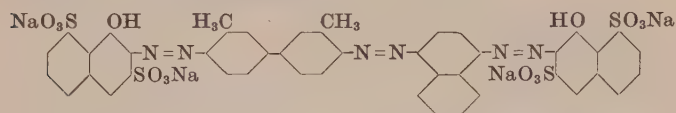
31905 Direct Dye



o-Tolidine \nearrow (1) 1-Naphthylamine \rightarrow (2) Neville and Winther's acid (2 mol.)

Discoverer — R. Lauch 1887
Benzo Black Blue R (By)
 Of moderate fastness to Acid, Alkali, Light and Washing
 Bayer Co., *BP* 16484/87; *USP* 440639; *FP* 187365

Soluble in water (bluish violet) and ethanol (violet)
 H_2SO_4 conc. — blue; on dilution — bluish violet ppt.
 Aqueous solution + HCl conc. — violet ppt;
 + NaOH conc. — redder

31910 C.I. Direct Blue 63 (Reddish navy)

o-Tolidine

(1) 1-Naphthylamine →

(2) 1-Naphthol-3,8-disulfonic acid
(2 mol.)

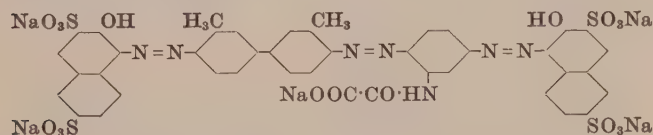
Discoverer — Schultz 1890

Agfa, BP 6932/90; FP 205615; GP 60921 (Fr. 3, 698)

FIAT 764 — Congoechtblau R

Paul, Z. angew. Chem., 9 (1896), 557

Soluble in water (blue) and ethanol (reddish violet)
H₂SO₄ conc. — dark blue; on dilution — blue ppt; HNO₃
conc. — dull brown
Aqueous solution + HCl conc. — blue ppt;
+ NaOH conc. — blue ppt.

31915 Direct Dye

o-Tolidine

(1) *m*-Aminooxanilic acid →

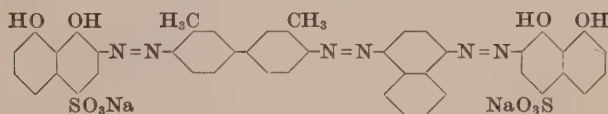
(2) R acid
(2 mol.)

Discoverer — Markfeldt 1894

Oxamine Violet MT (R)

Remy, BP 22114/95; FP 252140; GP 86791 (Fr. 4, 961)

Soluble in water (reddish violet)
Insoluble in ethanol
H₂SO₄ conc. — blue; on dilution — reddish violet solution and
ppt.
Aqueous solution + HCl conc. — reddish violet ppt;
+ NaOH conc. — bluish red ppt.

31920 Direct Dye

o-Tolidine

(1) 1-Naphthylamine →

(2) 4,5-Dihydroxy-1-naphthalenesulfonic acid
(2 mol.)

Discoverers — M. Ulrich and R. Lauch 1891

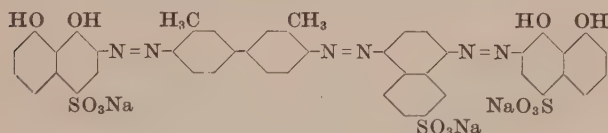
Benzo Indigo Blue (By)

Fastness Properties (C): Acid (organic) 4, Alkali 3,
Light 3, Washing 1-2, Water 3

Bayer Co., BP 13665/89; USP 476337, 501118; GP 57912
(Fr. 3, 661)

Brenner, Helv. Chim. Acta, 3 (1920), 98

Soluble in water (violet black)
Insoluble in ethanol
H₂SO₄ conc. — deep blue; on dilution — violet
Aqueous solution + HCl conc. — dark blue to blue black;
+ NaOH conc. — violet black

31925 C.I. Direct Black 24 (Black)

o-Tolidine

(1) 1,7-Cleve's acid →

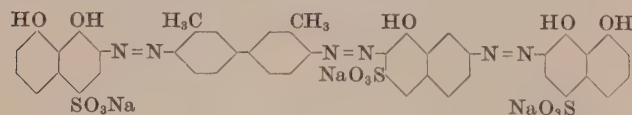
(2) 4,5-Dihydroxy-1-naphthalenesulfonic acid
(2 mol.)

Discoverers — K. Krekeler and W. A. Israel 1898

Bayer Co., USP 602856

FIAT 764 — Benzochromschwarz N

Soluble in water (dull violet)
Very slightly soluble in ethanol
H₂SO₄ conc. — blue; on dilution — pale violet
Aqueous solution + HCl conc. — dullish violet ppt;
+ NaOH conc. — dullish violet ppt.

31930 C.I. Direct Blue 26 (Reddish navy)

o-Tolidine

(1) (alk.) Gamma acid →

(2) 4,5-Dihydroxy-1-naphthalenesulfonic acid
(2 mol.)

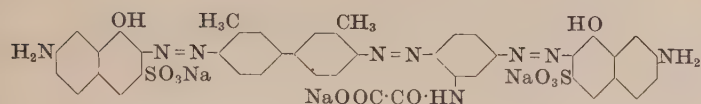
Discoverers — K. Krekeler and A. Blank 1898

Bayer Co., USP 602855

BIOS 1548, 173; FIAT 764 — Benzochromschwarzblau B

Soluble in water (dark navy blue)
Very slightly soluble in ethanol
H₂SO₄ conc. — blue; on dilution — pale violet
Aqueous solution + HCl conc. — dark navy blue ppt;
+ NaOH conc. — violet ppt.

31935 Direct Dye



\swarrow *o*-Tolidine
 \searrow (1) *m*-Aminooxanilic acid \rightarrow

(2) (alk.) Gamma acid
 (2 mol.)

Discoverer — Markfeldt 1894

Oxamine Black MT (R)

Remy, *BP* 22114/95; *FP* 252140; *GP* 86791 (*Fr.* 4, 961)

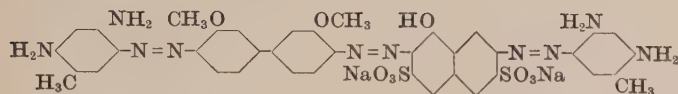
Soluble in water

Very slightly soluble in ethanol

H₂SO₄ conc. — blue; on dilution — violet black ppt.

Aqueous solution + HCl conc. — blackish blue ppt;
+ NaOH conc. — bluish black ppt.

31940 Direct Dye



\swarrow *o*-Dianisidine
 \searrow (1) (alk.) 2R acid \rightarrow

(2) Toluene-2,4-diamine
 (2 mol.)

Discoverer — R. Kirchhoff 1893

Columbia Black B (A)

Fastness Properties: Acid, good; Alkali, very good;
Light and Washing, fairly good

Agfa, *BP* 14895/93; *FP* 231976; *GP* 108215, 111744, (*Fr.* 5, 564, 565)

JSDC, 10 (1894), 186

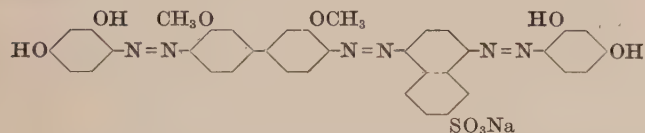
Chem. Ind. 19 (1896), 7; 20 (1897), 576

Soluble in water and ethanol (violet black)

H₂SO₄ conc. — blue black; on dilution — violet black ppt.

Aqueous solution + HCl conc. — dark flocculent ppt;
+ NaOH conc. — reddish violet

31945 Direct Dye



\swarrow *o*-Dianisidine
 \searrow (1) 1,7-Cleve's acid \rightarrow

(2) Resorcinol
 (2 mol.)

Discoverer — J. Jansen 1912

Benzoform Violet B (By)

Bayer Co., *BP* 14150/12; *FP* 458610; *GP* 270858 (*Fr.* 11, 427)

FIAT 764 — Benzoformviolett B

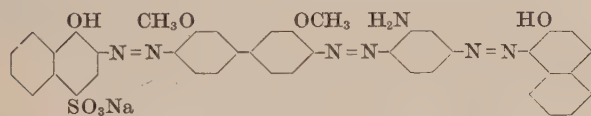
Moderately soluble in water (corinth)

Very slightly soluble in ethanol

H₂SO₄ conc. — blue; on dilution — pale corinth

Aqueous solution + HCl conc. — corinth, ppt;
+ NaOH conc. — corinth

31950 Direct Dye



\swarrow *o*-Dianisidine
 \searrow (1) Neville and Winther's acid
 \searrow (2) *m*-Aminooxanilic acid \rightarrow (3) 2-Naphthol
 and finally hydrolyse the amide group

Discoverer — Markfeldt 1894

Oxamine Blue BB (R)

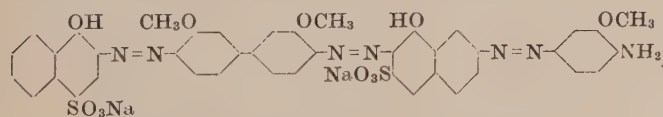
Remy, *BP* 22114/95; *FP* 252140; *GP* 86792 (*Fr.* 4, 958)

Soluble in water and ethanol (blue), ethanol solution becomes red on heating

H₂SO₄ conc. — greenish blue; on dilution — bluish violet ppt.

Aqueous solution + HCl conc. — bluish violet ppt;
+ NaOH conc. — magenta red

31951 C.I. Direct Blue 183 (Blue)⁽¹⁾



\swarrow *o*-Dianisidine
 \searrow Neville and Winther's acid
 \searrow (alk.) Gamma acid \rightarrow *o*-Anisidine

(1) Developed with 2-Naphthol

Discoverer — Schultz 1890

Agfa, *BP* 6932/90; *FP* 205615; *GP* 57444 (*Fr.* 3, 697)

FIAT 764 — Congoechtblau B

Paul, *Z. angew. Chem.* 9 (1896), 558

Soluble in water (blue)

Slightly soluble in ethanol (violet blue)

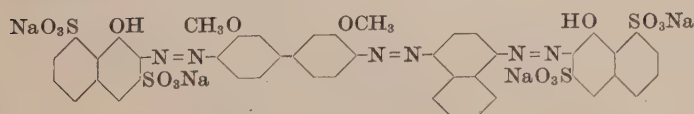
H₂SO₄ conc. — bluish green; on dilution — dull blue ppt;

HNO₃ conc. — reddish black

Aqueous solution + HCl conc. — blue ppt;

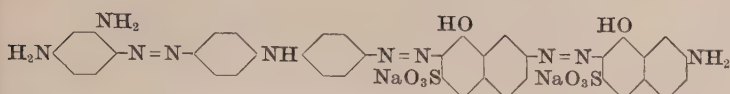
+ NaOH conc. — blue ppt.

31955 C.I. Direct Blue 30 (Dull greenish blue)



\swarrow *o*-Dianisidine
 \searrow (1) 1-Naphthylamine \rightarrow

(2) 1-Naphthol-3,8-disulfonic acid
 (2 mol.)

31995 Direct Dye

4,4'-Diaminodiphenylamine
 (1) *m*-Phenylenediamine
 (2) (alk.) [Gamma acid → (alk.) Gamma acid]

Discoverer — Bayer Co. 1909

Diamine Jet Black SS (By)

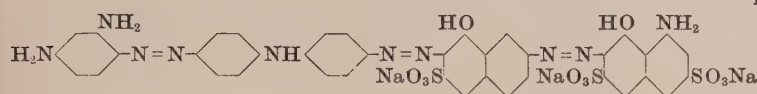
Fastness Properties (C): Acid 3-4, Alkali 5, Light 4, Washing 2, Water 3. Dischargeability, good. Used for dyeing cotton in unions during milling

FIAT 764 — Diamintiefschwarz SS

Soluble in water (dull reddish black)

H₂SO₄ conc. — blue black; on dilution — violet, then reddish black ppt.

Aqueous solution + HCl conc. — dull reddish black, ppt;
 + NaOH conc. — dull wine red, ppt.

32000 Direct Dye

4,4'-Diaminodiphenylamine
 (1) (alk.) Gamma acid → (2) (alk.) H acid
 (3) *m*-Phenylenediamine

Discoverer — Cassella Co. 1895

Diamine Black Blue B (C)

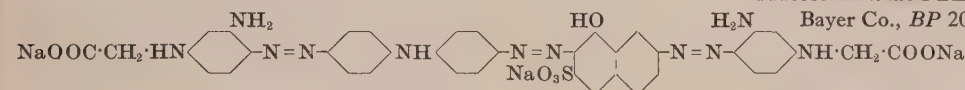
Fastness to Light and Washing improved by aftertreatment with copper sulfate

FIAT 764 — Diaminschwarzblau B

Soluble in water (dark blue)

H₂SO₄ conc. — dark reddish blue; on dilution — darker, ppt.

Aqueous solution + HCl conc. — dark blue ppt;
 + NaOH conc. — dark violet

32005 Direct Dye (Black)

4,4'-Diaminodiphenylamine
 (1) (alk.) Gamma acid → N-(*m*-Aminophenyl)glycine (2 mol.)

Discoverers — A. Blank and K. Heidenreich 1911

Plutoform Black BL, 3GL (By)

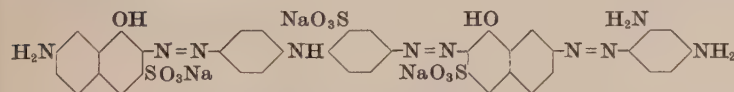
Bayer Co., BP 20608/11; USP 1056493; FP 445400; GP ap. F 33020 (Fr. 11, 427)

Moderately soluble in water (brownish grey to black)

Slightly soluble in ethanol (olive grey)

H₂SO₄ conc. — reddish black to corinth; on dilution — paleviolet grey; HNO₃ conc. — yellow brown

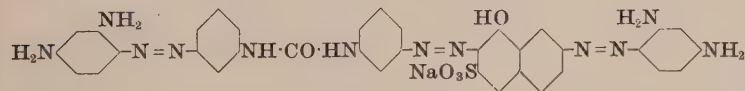
Aqueous solution + HCl conc. — greyish black ppt;
 + NaOH conc. — brown, ppt; + 10% NaOH — dull bordeaux

32010 Direct Dye

5-Amino-2-(*p*-aminoanilino)benzenesulfonic acid
 (1) (alk.) Gamma acid → (2) *m*-Phenylenediamine

Discoverer — Agfa

Halfwool Black M (A) for solid shades on cotton-wool unions

32015 Direct Dye

3,3'-Diaminocarbanilide
 (1) (alk.) Gamma acid → (2) *m*-Phenylenediamine (2 mol.)

Discoverers — A. Blank, C. Heidenreich, and J. Jansen 1912

Benzoform Brown 4R (By)

Fastness Properties (C), aftertreated with formaldehyde, Acid (organic) 5, Alkali 3, Light 1, Washing and Water 2-3

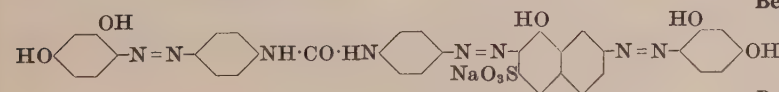
Bayer Co., BP 12217/13; USP 1082581; FP 458089; GP 268188 (Fr. 11, 425)

Moderately soluble in water (yellowish olive brown)

Very slightly soluble in ethanol

H₂SO₄ conc. — brown and magenta; on dilution — orange brown

Aqueous solution + HCl conc. — reddish brown, ppt;
 + NaOH conc. — reddish brown

32020 Direct Dye

4,4'-Diaminocarbanilide
 (1) (alk.) Gamma acid → (2) Resorcinol (2 mol.)

Discoverers — A. Blank, C. Heidenreich, and J. Jansen 1912

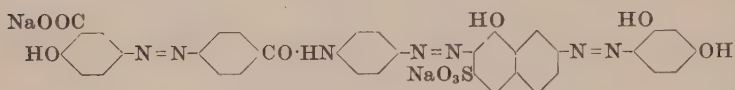
Benzoform Brown R (By)

Fastness Properties (C), aftertreated with formaldehyde: Acid (organic) and Alkali 3, Light 1, Washing 2-3, Water 3

Bayer Co., BP 12217/13; USP 1082581; FP 458089; GP 268188 (Fr. 11, 425)

FIAT 764 — Benzoformbraun R

32025 Direct Dye



(1) Salicylic acid
4,4'-Diaminobenzanilide
(2) (alk.) Gamma acid → (3) Resorcinol

Discoverer — H. Roos 1937

Benzoform Brown FC (By)

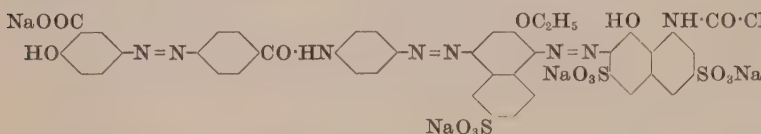
Fastness Properties (C), aftertreated with formaldehyde:
Acid (organic) 3-4, Alkali 3, Light 1, Washing 3,
Water 4. Dischargeability, good—very good

I.G., BP 497745; USP 2196028; FP 832003; GP 704455
(Fr.-Bayer, I-1, 1097)

FIAT 764 — Benzoformbraun FC, Benzoformbraun 8075

Soluble in water (reddish brown)
Moderately soluble in ethanol (reddish brown)
H₂SO₄ conc. — violet brown; on dilution — brown ppt.
Aqueous solution + HCl conc. — dark bluish violet, ppt;
+ NaOH conc. — orange brown, ppt.

32030 C.I. Direct Green 3 (Green)



(1) Salicylic acid
4,4'-Diaminobenzanilide
(2) 5-Amino-6-ethoxy-2-naphthalenesulfonic acid → N-Acetyl H acid

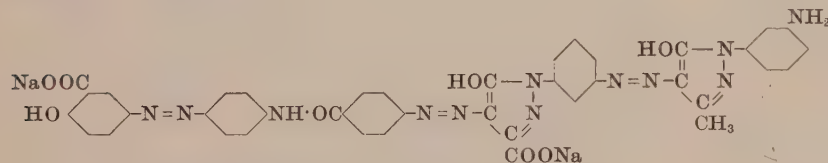
Discoverers — S. Petersen, E. Glietenberg, and K. Taube 1939

FBy., GP 858440

FIAT 764 — Brillantbenzoechtgruen 3GL

Soluble in water (green)
Very slightly soluble in ethanol (pale bluish green)
H₂SO₄ conc. — yellowish olive; on dilution — green
Aqueous solution + HCl conc. — green ppt;
+ NaOH conc. — dull bluish green ppt.

32035 Direct Dye



(1) Salicylic acid
p-Nitroaniline
(2) reduce nitro group, condense with p-nitrobenzoyl chloride, reduce nitro group
→ (3) 3-Carboxy-1-(m-nitrophenyl)-5-pyrazolone — (4) reduce
nitro group → (5) 1-(m-Aminophenyl)-3-methyl-5-pyrazolone

Discoverer — H. Roos 1934

Diazo Brilliant Orange 6G Extra (IG)

Fastness Properties (C): Developed 2-naphthol
(dull reddish yellow), Acid (organic) 3, Alkali
4, Cross dyeing (acid) 3, Light 2, 2, 3,
Washing 3-4, Water 4. Dischargeability:
neutral, very good; alkaline, fairly good

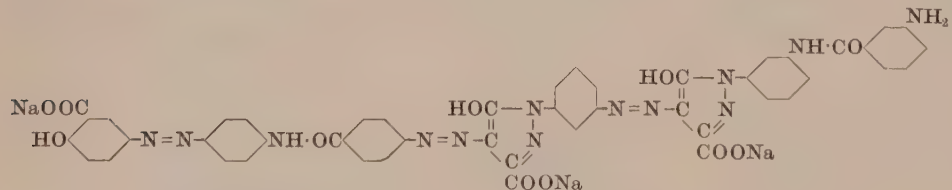
Developed methylphenylpyrazolone (bright
yellowish orange), Acid (organic) 3, Alkali
4-5, Cross dyeing (acid) 2-3, Light 3,
4, 4, Washing 3-4, Water 4-5
Dischargeability: neutral, good—very good;
alkaline, fairly good

I.G., BP 451100; USP 2172712; FP 791599; GP 632135 (Fr. 23,
809)

FIAT 764 — Diazobrilliantorange 6G ex.

Soluble in water (golden yellow)
Very slightly soluble in ethanol (greenish yellow)
H₂SO₄ conc. — brownish orange; on dilution — pale olive yellow
Aqueous solution + HCl conc. — yellowish brown, ppt;
+ NaOH conc. — golden yellow

32040 Direct Dye



(1) Salicylic acid
p-Nitroaniline
(2) reduce nitro group, condense with p-nitrobenzoyl chloride, reduce nitro group
→ (3) 3-Carboxy-1-(m-nitrophenyl)-5-pyrazolone — (4) reduce nitro group
→ (5) 3-Carboxy-1-[m-(m-nitrobenzamido)phenyl]-5-pyrazolone — (6) reduce nitro group

Discoverers — F. Suckfüll and H. Clingstein 1937

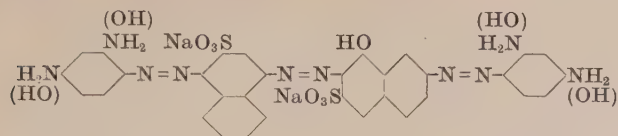
Diazo Golden Yellow G Extra (IG)

Fastness Properties (C): Developed 2-naphthol
(dull reddish yellow), Acid (organic) 3, Alkali 3-4,
Cross dyeing (acid) 3, Light 2, 3, 3, Washing 3-4, Water 4.
Dischargeability: neutral and
alkaline, very good

Developed methylphenylpyrazolone
(bright reddish yellow), Acid
(organic) 3, Alkali 3-4, Cross
dyeing (acid) 3, Light 3, 4, 4,
Washing 3-4, Water 4-5.
Dischargeability: neutral and
alkaline, very good

I.G., BP 492104; USP 2228288; FP 833819; GP 749167
FIAT 764 — Diazogoldgelb G ex.

Slightly soluble in water (golden yellow)
Very slightly soluble in ethanol
H₂SO₄ conc. — golden yellow; on dilution — paler
Aqueous solution + HCl conc. — yellowish brown, ppt;
+ NaOH conc. — golden yellow, ppt.

32045 Direct Dye


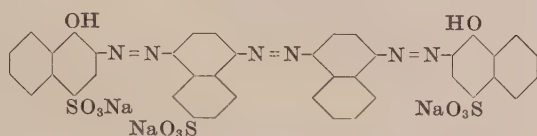
1,4-Diamino-2-naphthalenesulfonic acid
 (1) (alk.) Gamma acid → (2) E
 E = (a) *m*-Phenylenediamine or (b) Resorcinol

Discoverer — R. Herz 1896

Levinstein Ltd., BP 2946/96; 17065/96; USP 619194; FP 256862, 260268; GP 115990 (*Fr.* 6, 995)

Early literature associates these dyes with the Coomassie Union Blacks (Lev.) which it is stated were not placed on the market. The name implies that wool and cotton would be dyed in approximately equal depths

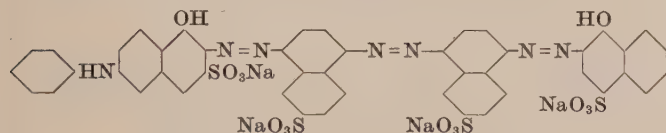
Soluble in water (violet)
 H₂SO₄ conc. — blue; on dilution — black blue
 Aqueous solution + HCl conc. — unaltered;
 + NaOH conc. — unaltered

32050 Direct Dye (Dull blue)


8-Acetamido-5-amino-2-naphthalenesulfonic acid
 (2) hydrolyse amide group → (3) Neville and Winther's acid (2 mol.)
 (1) 1-Naphthylamine

Dianil Fast Blue GL (MLB)

Fastness Properties (C): Acid (organic) 2-3, Alkali 3-4,
 Light 5, 5, 5-6, Washing 2-3, Water 1-2

32055 C.I. Direct Blue 34 (Blue)


8-Acetamido-5-amino-2-naphthalenesulfonic acid
 (3) hydrolyse amide group → (4) *N*-Phenyl J acid
 (1) 1,6-Cleve's acid → (2) Neville and Winther's acid

Discoverer — H. Jordan (Bayer Co.) 1913

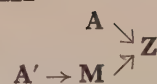
FIAT 764 — Siriusblau GG

Soluble in water (deep blue)
 Insoluble in ethanol
 H₂SO₄ conc. — dull greenish blue; on dilution — blue
 Aqueous solution + HCl conc. — hue unchanged, ppt;
 + NaOH conc. — hue unchanged, ppt.

NOTES

TRISAZO DYES — III

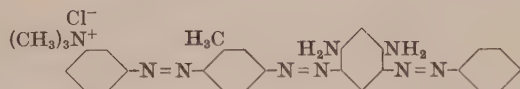
DYES OF GENERAL FORMULA:



This is a very small sub-group comprising a few Direct and Leather dyes of dark blue, dark green or brown hue. When Z is *m*-phenylenediamine or resorcinol the dyes are probably mixtures.

The arrangement is based primarily on the twice coupled component (Z). The total number of dyes contained in this sub-group is nine.

33500 Basic Dye



(*m*-Aminophenyl)trimethylammonium chloride
 \rightarrow (2) *m*-Toluidine (2) \rightarrow *m*-Phenylenediamine
 Aniline (1) \nearrow

Discoverers — B. Deicke and E. König 1896

Janus Brown R (MLB)

M.L.B., BP 9346/96, 19976/96, 5119/97; USP 602041, 610345, 623697, 626913; FP 256156, 264579; GP 93499 (Fr. 4, 819), GP 95530, 98435, 99127, 100420, (Fr. 5, 542, 544, 551, 547)

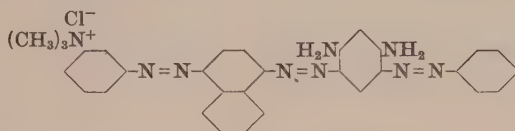
FIAT 764 — Janusbraun R

M.L.B., JSDC, 14 (1898), 146

Liebert, *Ibid.* 14 (1898), 222

Soluble in water (brown)
 H₂SO₄ conc. — navy blue; on dilution — reddish brown, then brown solution
 Aqueous solution + HCl — soluble brown ppt;
 + NaOH conc. — brown ppt.

33505 Basic Dye



(*m*-Aminophenyl)trimethylammonium chloride
 \rightarrow (2) 1-Naphthylamine (2) \rightarrow *m*-Phenylenediamine
 Aniline (1) \nearrow

Discoverer — E. König 1896

Janus Brown B (MLB)

Patents as for C.I.33500

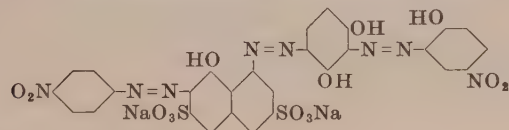
FIAT 764 — Janusbraun B

M.L.B., JSDC, 14 (1898), 146

Liebert, *Ibid.* 14 (1898), 222

Soluble in water (brown)
 H₂SO₄ conc. — dark green then reddish brown; on dilution — brown
 Aqueous solution + HCl conc. — brown ppt;
 + NaOH conc. — brown ppt.

33520 C.I. Acid Brown 121 (Dull yellowish brown)*

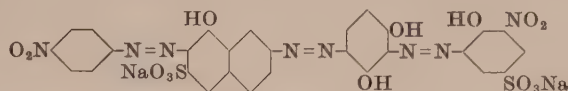


p-Nitroaniline \rightarrow (2) H acid (1) \rightarrow Resorcinol
 2-Amino-4-nitrophenol (2) \nearrow

Soluble in water (brown)
 H₂SO₄ conc. — dark brown; on dilution — brown
 Aqueous solution + HCl conc. — brown ppt;
 + NaOH dil. — reddish brown

* On leather

33525 C.I. Acid Brown 122 (Dull reddish brown)*

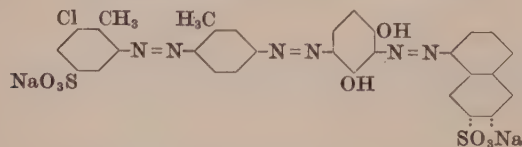


p-Nitroaniline \rightarrow (2) Gamma acid (1) \rightarrow Resorcinol
 2-Amino-6-nitro-1-phenol-4-sulfonic acid (2) \nearrow

Soluble in water (orange brown)
 H₂SO₄ conc. — dull red; on dilution — brown ppt.
 Aqueous solution + HCl conc. — orange brown
 + NaOH dil. — bluish red

* On leather

33530 C.I. Acid Brown 105 (Dull reddish brown)*



3-Amino-5-chloro-*p*-toluenesulfonic acid
 \rightarrow (1) *m*-Toluidine (2) \rightarrow Resorcinol
 1,6(and 1,7)-Cleve's acid (2) \nearrow

Discoverer — B. Vossen 1925

For similar dyes see —

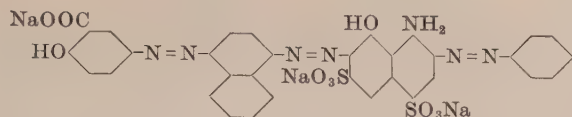
I.G., BP 247187, 251140; USP 1565347, 1690318; FP 599511, 609904; GP 513842 (Fr. 16, 1667)

BIOS 961, 62

FIAT 764 — Saeurelederbraun EGR

* On leather

33540 Mordant Dye



5-Aminosalicylic acid \rightarrow (2) 1-Naphthylamine (3) (alk.) \rightarrow K acid
Aniline (1) (acid) \rightarrow

Discoverer — K. Elbel 1898

Chrome Patent Green A (K). Dyed on wool (afterchromed) gives moderately bright deep bluish green of good fastness to acids, alkali, light and milling

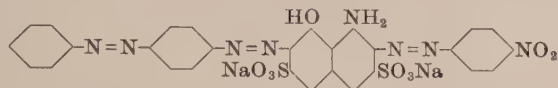
Kalle Co., BP 23893/98; FP 282619; GP 116640 (Fr. 5, 947)

Soluble in water (greenish blue)

H₂SO₄ conc. — green; on dilution — greenish blue then black ppt.

Aqueous solution + NaOH conc. — bluish violet ppt.

33545 C.I. Acid Green 33 (Dull bluish green)



p-Phenylazoaniline (2) (alk.) \rightarrow H acid
p-Nitroaniline (1) (acid) \rightarrow

Discoverer — M. Hoffmann 1891

Wool Dark Green AZ (C)

Cassella Co., BP 6972/91; USP 480326; FP 204770; GP 65651 (Fr. 3, 675)

FIAT 764 — Woll Dunkelgruen AZ ex. kz.

Soluble in water

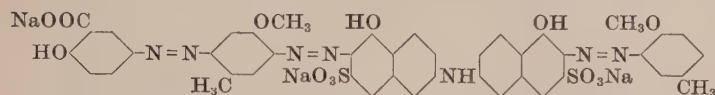
Slightly soluble in ethanol and acetone

Very slightly soluble in benzene

H₂SO₄ conc. — bluish green; on dilution — bluish green

Aqueous solution + NaOH conc. — greyish blue

33560 C.I. Direct Blue 163 (Dull reddish blue)*



5-Aminosalicylic acid (1) \rightarrow Cresidine (2) \rightarrow 6,6'-Iminobis-1-naphthol-3-sulfonic acid
Cresidine (2) \rightarrow

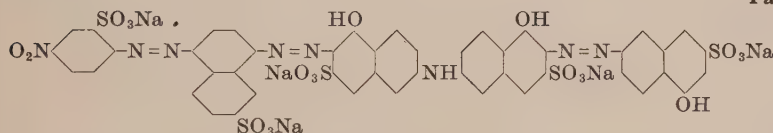
Discoverer — W. Anderau 1941

Ciba, BP 559680; USP 2369516; Sw.P 227126; GP 737782 (Fr.-Bayer, I-1, 1451)

Frahm, Chem. Weekbl. 48 (1952), 130 (Coprantine Blue 3RLL)

* Aftertreated with a copper salt

33565 Direct Dye



2-Amino-5-nitrobenzenesulfonic acid (1) \rightarrow 1,7-Cleve's acid (2) \rightarrow 6,6'-Iminobis-1-naphthol-3-sulfonic acid
J acid (3) \rightarrow

Discoverers — H. Schweitzer and A. Zart 1912

Para Indigo Blue RR Extra (By) may be coupled with diazotised p-nitroaniline

Bayer Co., BP 18073/12; USP 1088735; FP 442697; GP 267078 (Fr. 11, 437)

Moderately soluble in water (dark violet)

Very slightly soluble in ethanol (pale greyish violet)

H₂SO₄ conc. — greenish blue; on dilution — violet to corinth

Aqueous solution + HCl conc. — dark violet, ppt;

+ NaOH conc. — violet black, ppt.

NOTES

TRISAZO DYES — IV

DYES OF GENERAL FORMULA: $A \rightarrow M \rightarrow M' \rightarrow E$

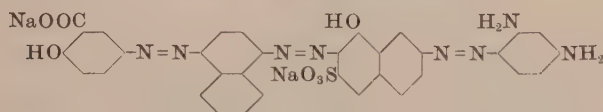
These are Direct dyes which make an important contribution to the blue to grey section of the hue range in contrast to the generally dark and drab hues characteristic of the preceding groups of trisazo dyes. The Direct dyes in which E is J acid, or an *N*-substituted derivative thereof, are generally conspicuous for their blue shade, good affinity for cellulosic fibres and good light fastness.

In a number of cases, notably when M' carries an alkoxy group in ortho position to the diazotisable amino group, the final coupling to E requires the presence of pyridine or similar base.

The dyes are arranged in order by taking the components in the sequence: End component (E), Middle component (M'), Middle component (M), Diazo component (A). They fall into the following groups —

| C.I. Numbers | Nature of "E" Component | Hues | Number of Dyes Contained |
|--------------------|---------------------------------|----------------------------|--------------------------|
| 34005–34010 | 2,5-Xylidine, Cresidine | Blue (developed) | 2 |
| 34000, 34015–34025 | <i>m</i> -Diamine | Dull bordeaux, brown, grey | 4 |
| 34035 | Phenol (ethylated) | Brown | 1 |
| 34040–34060 | Salicylic acid, Resorcinol | Blue, green | 5 |
| 34080–34100 | Naphtholsulfonic acid | Blue (developed) | 5 |
| 34120–34155 | J acid | Blue | 10 |
| 34170–34180 | Gamma acid | Bluish grey | 4 |
| 34200–34230 | <i>N</i> -Phenyl-J acid | Blue | 7 |
| 34250–34255 | <i>N</i> -Carbamoyl-J acid | Bluish red | 2 |
| 34260 | <i>N-m</i> -Aminobenzoyl-J acid | Green (developed) | 1 |
| 34270 | <i>N</i> -Acetyl-H acid | Green | 1 |
| 34280 | 2-Methylindole | Green | 1 |
| 34285 | 2,4-Quinolinediol | Brown | 1 |
| 34290–34300 | Pyrazolone | Orange, blue and green | 3 |
| TOTAL | | | 47 |

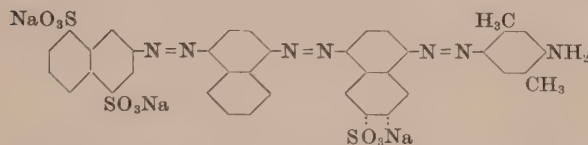
34000 C.I. Direct Black 48 (Greenish grey)



5-Aminosalicylic acid \rightarrow 1-Naphthylamine \rightarrow (alk.) Gamma acid \rightarrow *m*-Phenylenediamine

Soluble in water (greenish black)
 H_2SO_4 conc. — bluish green; on dilution — reddish black ppt.
 Aqueous solution + HCl conc. — greenish black ppt;
 + NaOH conc. — bluish black ppt.

34005 C.I. Direct Blue 133 (Dull reddish violet \rightarrow Dull reddish blue)*



3-Amino-1,5-naphthalenedisulfonic acid \rightarrow 1-Naphthylamine \rightarrow 1,6(and 1,7)-Cleve's acid \rightarrow 2,5-Xylidine

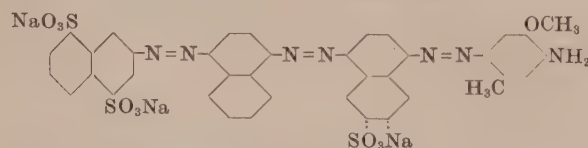
The constitution given for Naphthogene Blue 4R under C.I.534 (1st edition) was incorrect

* Developed with 2-naphthol

Discoverer — Agfa 1902
 FIAT 764 — Diazoindigoblau 4RL, Naphthogenblau 4R

Soluble in water (reddish violet to blue)
 H_2SO_4 conc. — greenish black; on dilution — dull purple to brown ppt.
 Aqueous solution + H_2SO_4 10% — slightly bluer;
 + NaOH 10% — reddish violet

34010 C.I. Direct Blue 126 (Reddish navy)*

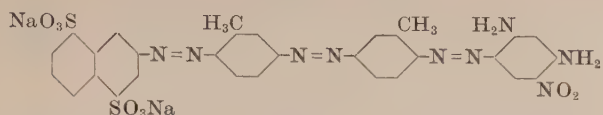


3-Amino-1,5-naphthalenedisulfonic acid \rightarrow 1-Naphthylamine \rightarrow 1,6(and 1,7)-Cleve's acid \rightarrow Cresidine

* Developed with 2-naphthol

Discoverer — Cassella Co. 1903
 Cassella Co., GP 163321 (Fr. 8, 683)
 FIAT 764 — Diazoindigoblau 2RL

Soluble in water (violet)
 Slightly soluble in ethanol and Cellosolve
 Insoluble in other organic solvents
 H_2SO_4 conc. — greenish black; on dilution — dark reddish blue ppt; HNO_3 conc. — partly soluble, reddish grey
 Aqueous solution + HCl conc. — blue ppt;
 + NaOH conc. — purplish red

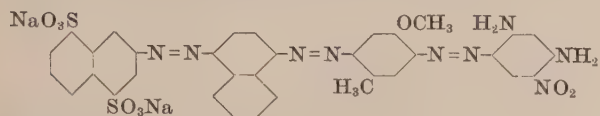
34015 C.I. Direct Brown 32 (Orange brown)

3-Amino-1,5-naphthalenedisulfonic acid → *m*-Toluidine
→ *o*-Toluidine → 4-Nitro-*m*-phenylenediamine

Discoverer — A. Blank 1910

Bayer Co., *BP* 12126/10; *USP* 1051859, 1052031; *FP* 430527;
GP 243124 (*Fr.* 10, 868)
BIOS 1548, 193; *FIAT* 764 — Toluylenechtbraun 3G

Soluble in water (yellowish brown) and Cellosolve (orange)
Very slightly soluble in ethanol
Insoluble in other organic solvents
 H_2SO_4 conc. — blue to corinth; on dilution — paler, brown ppt.
 HNO_3 conc. — partial solution (bluish violet)
Aqueous solution + HCl conc. — brown ppt;
+ $NaOH$ conc. — orange brown

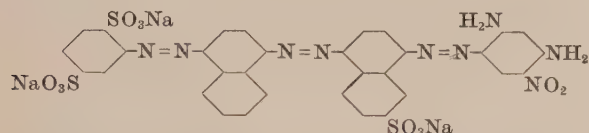
34020 C.I. Direct Brown 99 (Reddish brown)

3-Amino-1,5-naphthalenedisulfonic acid → 1-Naphthylamine
→ Cresidine → 4-Nitro-*m*-phenylenediamine

Discoverer — A. Blank 1910

Bayer Co., *BP* 12126/10; *USP* 1051859, 1052031; *FP* 430527;
GP 243124 (*Fr.* 10, 868)
BIOS 1548, 192; *FIAT* 764 — Siriusbraun RV

Moderately soluble in water and ethanol (brown)
 H_2SO_4 conc. — bluish green (+ violet black);
on dilution — pale reddish brown
Aqueous solution + HCl conc. — brown ppt;
+ $NaOH$ conc. — yellowish brown, brown ppt.

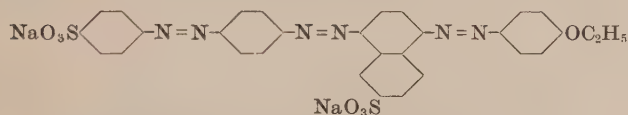
34025 C.I. Direct Red 103 (Dull bluish bordeaux)

2-Amino-*p*-benzenedisulfonic acid → 1-Naphthylamine
→ 1,7-Cleve's acid → 4-Nitro-*m*-phenylenediamine

Discoverer — Agfa 1924

FIAT 764 — Siriuskorinth B

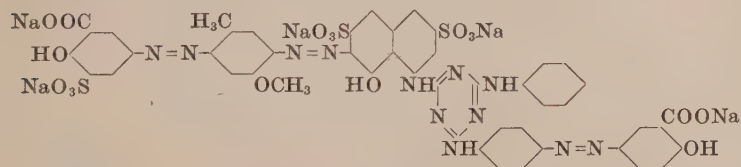
Soluble in water (wine red to bordeaux)
Slightly soluble in ethanol
 H_2SO_4 conc. — blue + grey; on dilution — pale reddish brown
Aqueous solution + HCl conc. — reddish brown ppt;
+ $NaOH$ conc. — orange brown ppt.

34035 C.I. Direct Brown 202 (Dull yellowish red → Brown)

p-(*p*-Aminophenylazo)benzenesulfonic acid
→ 1,6-Cleve's acid → Phenol;
finally ethylate

Discoverer — I.G.

FIAT 1313, 3, 186

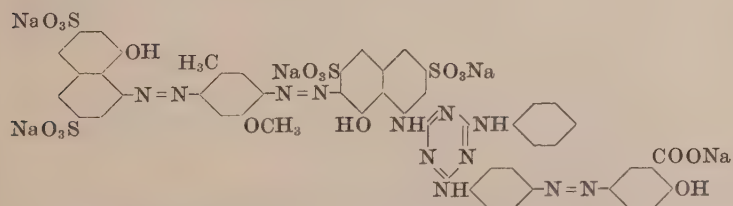
34040 C.I. Direct Green 59 (Green)*

Condense Cyanuric chloride successively with (1) *H* acid (2) the azo dye obtained by reducing the nitro group in *p*-Nitroaniline
→ Salicylic acid and (3) Aniline. Then use the product as coupling component (E) in 5-Amino-3-sulfosalicylic acid → Cresidine → E

* Aftertreated with copper sulfate

Discoverer — O. Kaiser 1940

Ciba, *BP* 582977; *USP* 2396659; *Sw.P* 221205; *GP* 740050
(*Fr.* Bayer, I-1, 1435)
Frahm, *Chem. Weekbl.* 48 (1952), 130 (Coprantine Green G)

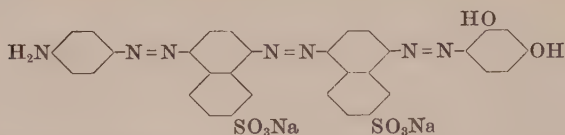
34045 C.I. Direct Green 26 (Bluish green)

Condense Cyanuric chloride successively with (1) *H* acid, (2) the azo dye obtained by reducing the nitro group in *p*-Nitroaniline
→ Salicylic acid and (3) Aniline. Then use the product as coupling component (E) in *H* acid → Cresidine → E

Discoverers — H. Fritzsche, E. Krummenacher, H. Gubler, and
O. Kaiser 1923

Ciba, *BP* 209723; *USP* 1667312; *FP* 576725; *Sw.P* 109481, 110643;
GP 436179 (*Fr.* 15, 531)
Fierz-David & Matter, *JSDC*, 53 (1937), 433

Soluble in water (green)
Insoluble in organic solvents
 H_2SO_4 conc. — yellowish green; on dilution — dark blue ppt.
Reduced with zinc and ammonia, greenish yellow

34050 Direct Dye (Blue)*

p-Aminooxanilic acid → 1,7-Cleve's acid → 1,7-Cleve's acid
 finally hydrolyse the oxamic acid group → Resorcinol;

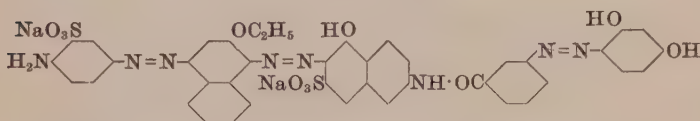
* Aftertreated with formaldehyde

Discoverers — A. Blank, C. Heidenreich, and J. Jansen 1913

Benzoform Blue BBL (By)

Fastness Properties (C), aftertreated with formaldehyde:
 Acid, 3, Alkali 3, Light 2, Washing 2, Water 2
 Dischargeability, good—very good
 Bayer Co., BP 8043/14; USP 1125050; FP 471284; GP 287072
 (Fr. 12, 359)
 FIAT 764 — Benzoformblau BBL

Soluble in water (bordeaux)
 Slightly soluble in ethanol
 H₂SO₄ conc. — dark olive green (+ magenta);
 on dilution — corinth
 Aqueous solution + HCl conc. — dull bluish violet ppt;
 + NaOH conc. — greyish violet, corinth ppt.

34055 Direct Dye (Bluish green)*

4'-Amino-2'-sulfooxanilic acid → 2-Ethoxy-1-naphthylamine
 → *N*-*m*-Aminobenzoyl J acid → Resorcinol;
 and finally hydrolyse the oxamic acid group

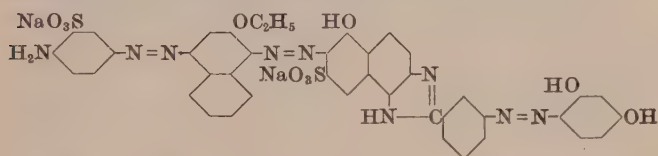
* Aftertreated with formaldehyde

Discoverer — T. Kollmann 1937

Benzoform Green FFG (IG)

Fastness Properties (C), aftertreated with formaldehyde:
 Acid (organic) 3, Alkali 4, Light 2, 3, 4, Washing 3,
 Water 3-4. Dischargeability, very good
 I.G., BP 519644; USP 2195089; FP 843611; GP 695403
 (Fr.-Bayer, I-1, 1107)
 BIOS 1548, 182; FIAT 764 — Benzoformgruen FFG

Soluble in water (bluish green)
 Almost insoluble in ethanol
 H₂SO₄ conc. — olive; on dilution — yellowish olive
 Aqueous solution + HCl conc. — olive green, ppt;
 + NaOH conc. — greenish blue to grey, ppt.

34060 Direct Dye (Bluish green)*

4'-Amino-2'-sulfooxanilic acid → 2-Ethoxy-1-naphthylamine
 → 2-(*m*-Aminophenyl)-6-hydroxy-1*H*-naphth[1,2]imidazole-8-sulfonic acid
 → Resorcinol;
 and finally hydrolyse the oxamic acid group

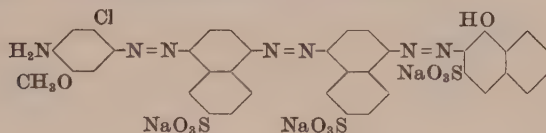
* Aftertreated with formaldehyde

Discoverers — A. Blank, C. Heidenreich, and J. Jansen 1913

Benzoform Green FFL (By)

Fastness Properties (C), aftertreated with formaldehyde:
 Acid (organic) 3, Alkali 5, Light 3, 3, 4, Washing 2-3,
 Water 3. Dischargeability, fair
 Bayer Co., USP 1150656; FP 470670; GP 276140 (Fr. 12, 356)
 FIAT 764 — Benzoformgruen FFL

Soluble in water (bluish green)
 Very slightly soluble in ethanol
 H₂SO₄ conc. — olive to dark blue; on dilution — pale yellowish
 olive brown
 Aqueous solution + HCl conc. — olive green ppt;
 + NaOH conc. — greenish blue to grey ppt.

34080 C.I. Direct Blue 127 (Greenish blue)*

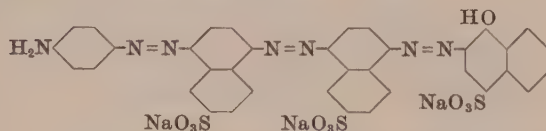
4'-Amino-5'-chloro-2'-methoxyoxanilic acid → 1,6-Cleve's acid
 → 1,6-Cleve's acid → 1-Naphthol-3-sulfonic acid;
 and finally hydrolyse the oxamic acid group

* Developed with 2-naphthol

Discoverers — H. Jordan and W. Neelmeier 1910

Bayer Co., BP 20025/10; USP 1010433; FP 427527; GP *ap*.
 F29611 (Fr. 10, 884)
 BIOS 1548, 176; FIAT 764 — Diazoindigoblau 4GL ex.

Soluble in water (navy blue)
 Slightly soluble in ethanol
 H₂SO₄ conc. — bluish grey to greenish black; on dilution —
 violet
 Aqueous solution + HCl conc. — dark navy blue ppt;
 + NaOH conc. — dark blue ppt.

34085 C.I. Direct Blue 120 (Blue → Navy)*

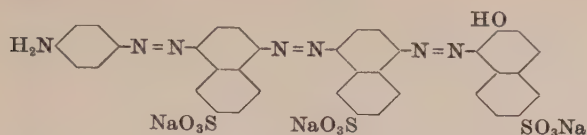
p-Aminooxanilic acid → 1,6-Cleve's acid → 1,6-Cleve's acid
 → Nevile and Winther's acid;
 and hydrolyse the oxamic acid group

* Developed with 2-naphthol

Discoverers — W. A. Israel and R. Kothe 1900

Bayer Co., BP 7292/00; USP 648623; FP 299270; GP 116348
 (Fr. 6, 947)
 FIAT 764 — Diazoindigoblau BR ex.

Soluble in water (navy blue)
 Slightly soluble in ethanol and Cellosolve
 Insoluble in other organic solvents
 H₂SO₄ conc. — dull greenish blue to olive; on dilution — dull
 violet
 HNO₃ conc. — dull purple solution
 HCl conc. — reddish blue solution
 Aqueous solution + HCl conc. — violet black ppt;
 + NaOH conc. — blue black ppt;
 + NaOH diluent — dull blue solution

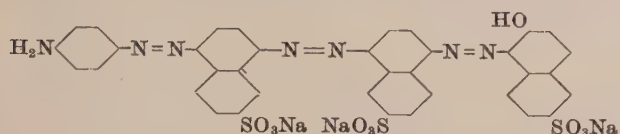
34090 C.I. Direct Blue 120A (Blue → Navy)*

p-Aminooxanilic acid → 1,6-Cleve's acid → 1,6-Cleve's acid
→ Schaeffer's acid;
and finally hydrolyse the oxamic acid group

* Developed with 2-naphthol

Discoverers — W. A. Israel and R. Kothe 1900
Bayer Co., BP 7292/00; USP 648623; FP 299270; GP 116348
(Fr. 6, 947)
FIAT 764 — Diazoindigoblau M

Soluble in water (dark violet)
Slightly soluble in ethanol
H₂SO₄ conc. — grey; on dilution — violet
Aqueous solution + HCl conc. — corinth ppt;
+ NaOH conc. — corinth ppt.

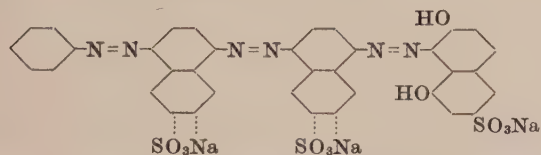
34095 C.I. Direct Blue 121 (Reddish blue)*

p-Aminooxanilic acid → 1,7-Cleve's acid → 1,6-Cleve's acid
→ Schaeffer's acid;
and finally hydrolyse the oxamic acid group

* Developed with 2-naphthol

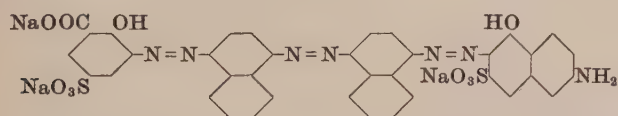
Discoverers — W. A. Israel and R. Kothe 1899
Bayer Co., BP 7292/00; USP 648623; FP 299270; GP 116348
(Fr. 6, 947)
FIAT 764 — Diazoindigoblau RM

Soluble in water (bluish violet to navy blue)
Very slightly soluble in ethanol
H₂SO₄ conc. — violet grey; on dilution — violet, reddish blue
ppt.
Aqueous solution + HCl conc. — bluish black ppt;
+ NaOH conc. — navy blue ppt.

34100 C.I. Direct Black 101 (Grey)

Aniline → 1,6(and 1,7)-Cleve's acid → 1,6(and 1,7)-Cleve's acid
→ 4,6-Dihydroxy-2-naphthalenesulfonic acid

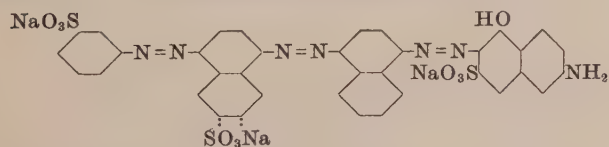
Discoverer — Pol

34120 Direct Dye (Dull blue)

3-Amino-5-sulfosalicylic acid → 1-Naphthylamine
→ 1-Naphthylamine → (alk.) J acid

Discoverers — W. A. Israel and R. Kothe 1900
Benzo Fast Blue BN (By)
Fastness Properties (C): Acid (organic) 4, Alkali 5, Light
5-6, Washing 1-2, Water 1
Bayer Co., BP 3673/00; USP 658897; FP 297506; GP 121867
(Fr. 6, 949)

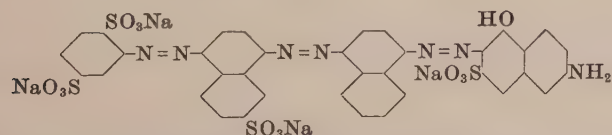
Soluble in water (navy blue)
Slightly soluble in ethanol (navy blue)
H₂SO₄ conc. — bluish black; on dilution — reddish violet
Aqueous solution + HCl conc. — dullish violet, ppt;
+ NaOH conc. — navy blue, ppt.

34125 C.I. Direct Blue 110 (Dull blue → Navy)

Metanilic acid → 1,6(and 1,7)-Cleve's acid → 1-Naphthylamine
→ (alk.) J acid

Discoverers — W. A. Israel and R. Kothe 1900
Bayer Co., BP 3673/00; USP 658897; FP 297506; GP 121867
(Fr. 6, 949)
FIAT 764 — Benzoechtblau G

Soluble in water (violet black)
Slightly soluble in ethanol
H₂SO₄ conc. — dull violet to black; on dilution — violet
Aqueous solution + HCl conc. — dark blue ppt;
+ NaOH conc. — dull violet ppt.

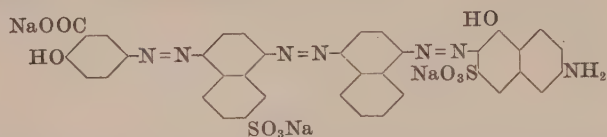
34130 C.I. Direct Blue 82 (Blue)

2-Amino-*p*-benzenedisulfonic acid → 1,7-Cleve's acid
→ 1-Naphthylamine → (alk.) J acid

Discoverers — W. A. Israel and R. Kothe 1900; H. Jordan 1912
Bayer Co., BP 3673/00; USP 658897; FP 297506; GP 121867
(Fr. 6, 949)
FIAT 764 — Siriusblau GR

Very soluble in water (blue)
Very slightly soluble in ethanol
H₂SO₄ conc. — violet black; on dilution — violet
Aqueous solution + HCl conc. — dull violet blue ppt;
+ NaOH conc. — reddish violet ppt.

34135 C.I. Direct Blue 148 (Dull blue)*



5-Aminosalicylic acid \rightarrow 1,7-Cleve's acid
 \rightarrow 1-Naphthylamine \rightarrow (alk.) J acid

* Aftertreated with copper sulfate

Discoverer — H. Schweitzer 1927

I.G., BP 285442; USP 1878548; FP 649083; GP 495621 (Fr. 16, 984)
 BIOS 1548, 112; FIAT 764 — Benzoehtkupferblau GL

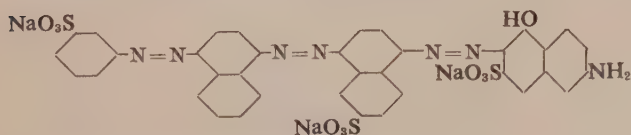
Soluble in water (dark violet)

Slightly soluble in ethanol

H₂SO₄ conc. — dark greyish violet; on dilution — dark reddish blue

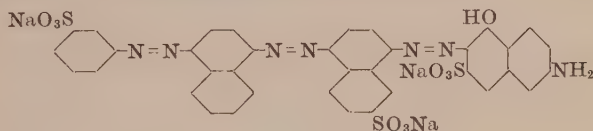
Aqueous solution + HCl conc. — navy blue ppt;
 + NaOH conc. — unaltered

34138 C.I. Direct Blue 258 (Dull blue)



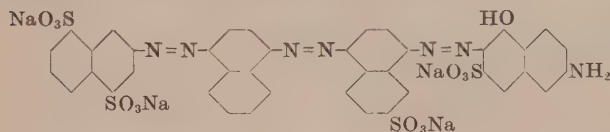
Metanilic acid \rightarrow 1-naphthylamine \rightarrow 1,6-Cleve's acid
 acid $\xrightarrow{\text{alk}}$ J acid

34139 C.I. Direct Blue 186 (Reddish navy)



Metanilic acid \rightarrow 1-Naphthylamine \rightarrow 1,7-Cleve's acid \rightarrow J acid

34140 C.I. Direct Blue 71 (Dull blue)



3-Amino-1,5-naphthalenedisulfonic acid \rightarrow 1-Naphthylamine
 \rightarrow 1,7-Cleve's acid \rightarrow (alk.) J acid

Discoverers — W. A. Israel and R. Kothe 1900; H. Jordan 1913
 Bayer Co., BP 3673/00; USP 658897; FP 297506; GP 121867 (Fr. 6, 949)

BIOS 1548, 134; FIAT 764 — Benzolichtblau FFL,
 Siriuslichtblau BRR

Soluble in water (blue)

Slightly soluble in Cellosolve

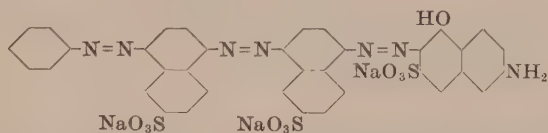
Very slightly soluble in ethanol

Insoluble in other organic solvents

H₂SO₄ conc. — blue to grey black; on dilution — reddish violet ppt.

Aqueous solution + HCl conc. — blue, ppt;
 + NaOH conc. — reddish violet, ppt.

34145 C.I. Direct Blue 72 (Dull blue \rightarrow Navy)



Aniline \rightarrow 1,6-Cleve's acid \rightarrow 1,6-Cleve's acid \rightarrow (alk.) J acid

Discoverers — W. A. Israel and R. Kothe 1900

Bayer Co., BP 3673/00; USP 658897; FP 297506; GP 121867 (Fr. 6, 949)

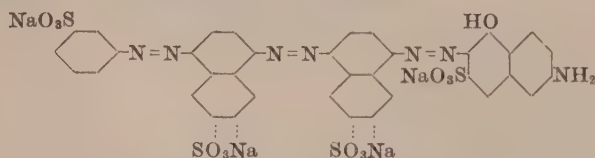
Moderately soluble in water (violet black) and ethanol

H₂SO₄ conc. — dull greenish blue; on dilution — corinth

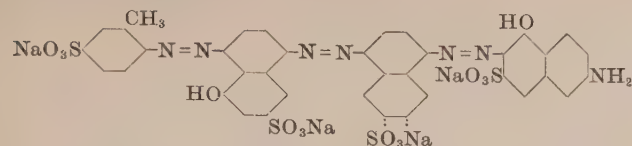
Aqueous solution + HCl conc. — dark blue ppt;

+ NaOH conc. — dullish violet ppt.

34146 C.I. Direct Blue 74 (Dull Blue)



Metanilic acid \rightarrow 1,6(and 1,7)-Cleve's acid
 \rightarrow 1,6(and 1,7)-Cleve's acid \rightarrow J acid

34150★ Direct Dye

4-Amino-*m*-toluenesulfonic acid → M acid
→ 1,6(and 1,7)-Cleve's acid → (alk.) J acid

Discoverer — Badische Co. 1911

Oxamine Light Blue B (B)

Fastness Properties: Acid (organic), fairly good; Light, good; Washing and Water, moderate

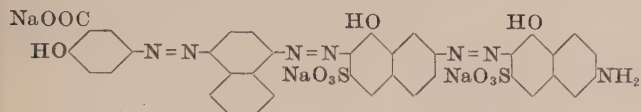
Soluble in water (dark blue)

Insoluble in ethanol

H₂SO₄ conc. — dull bluish green; on dilution — violet brown

Aqueous solution + HCl conc. — navy blue ppt;

+ NaOH conc. — dark blue

34155 C.I. Direct Black 49 (Bluish grey)

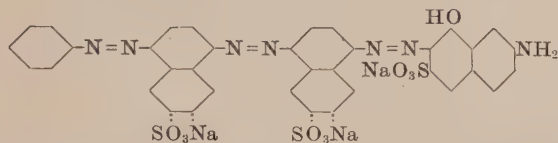
5-Aminosalicylic acid → 1-Naphthylamine
→ (alk.) Gamma acid → (alk.) J acid

Soluble in water (bluish violet)

H₂SO₄ conc. — dark green; on dilution — bluish black ppt.

Aqueous solution + HCl conc. — blue ppt;

+ NaOH conc. — blue

34170 C.I. Direct Black 56 (Reddish grey)

Aniline → 1,6(and 1,7)-Cleve's acid → 1,6(and 1,7)-Cleve's acid
→ (alk.) Gamma acid

Discoverer — C. Hagemann 1914

Bayer Co., USP 1270290; GP 293184 (Fr. 13, 515)

FIAT 764 — Benzolichtgrau B, Siriusgrau RR

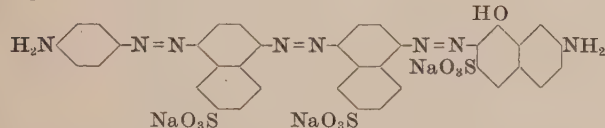
Soluble in water (dull violet)

Insoluble in ethanol

H₂SO₄ conc. — greenish grey blue; on dilution — violet

Aqueous solution + HCl conc. — dull blue ppt;

+ NaOH conc. — dull violet ppt.

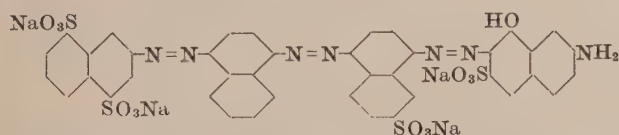
34175 C.I. Direct Blue 239

p-Aminooxanilic acid → 1,6-Cleve's acid → 1,6-Cleve's acid
→ (alk.) Gamma acid;

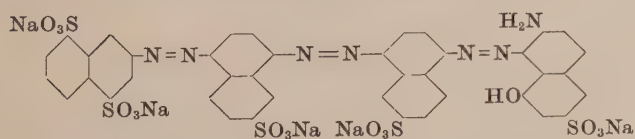
and hydrolyse the oxamic acid group

Discoverer — I.G.

FIAT 1313, 3, 171

34179 C.I. Direct Black 103 (Bluish grey)

3-Amino-1,5-naphthalenedisulfonic acid → 1-Naphthylamine
→ 1,7-Cleve's acid → (alk.) Gamma acid

34180 C.I. Direct Black 74 (Bluish grey)

3-Amino-1,5-naphthalenedisulfonic acid → 1,7-Cleve's acid
→ 1,6-Cleve's acid → (acid) Gamma acid

Discoverer — K. Hagemann 1914

Bayer Co., USP 1270290; GP 293184 (Fr. 13, 515)

FIAT 764 — Siriusgrau G

Fierz, JSDC, 45 (1929), 133 (similar dye)

Soluble in water (bluish grey to black)

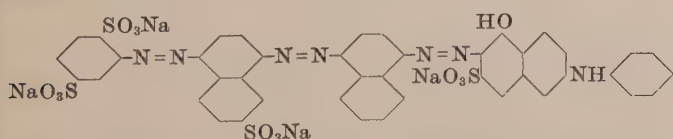
Insoluble in organic solvents

H₂SO₄ conc. — bluish grey to black; on dilution — dull violet ppt;

HNO₃ conc. — dark brown solution

Aqueous solution + HCl conc. — violet grey ppt;

+ NaOH conc. — grey ppt.

34200 C.I. Direct Blue 78 (Blue)

2-Amino-*p*-benzenedisulfonic acid → 1,7-Cleve's acid
→ 1-Naphthylamine → (alk.) *N*-Phenyl J acid

Discoverers — W. A. Israel and R. Kothe 1900; H. Jordan and W. Neelmeier 1910

Bayer Co., BP 3673/00; USP 658897; FP 297506; GP 121868 (Fr. 6, 950)

BIOS 1548, 131; FIAT 764 — Siriuslichtblau G

Soluble in water (blue) and Cellosolve

Slightly soluble in ethanol

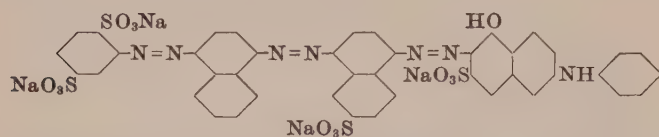
Insoluble in other organic solvents

H₂SO₄ conc. — corinth to violet black; on dilution — corinth

HNO₃ conc. — brownish grey

Aqueous solution + HCl conc. — reddish blue;

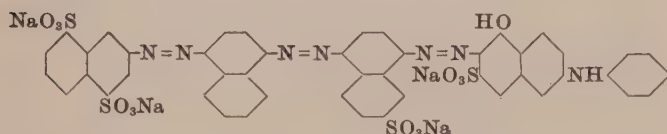
+ NaOH conc. — reddish violet

34205 C.I. Direct Blue 70 (Blue)

2-Amino-*p*-benzenedisulfonic acid → 1-Naphthylamine
→ 1,6-Cleve's acid → (alk.) *N*-Phenyl J acid

Discoverers — W. A. Israel and R. Kothe 1900; H. Jordan 1909
Bayer Co., BP 3673/00; USP 658897; FP 297506; GP 121868
(Fr. 6, 950)
FIAT 764 — Siriusblau FG
Fierz-David & Blangey, 279

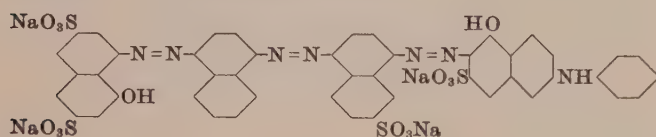
Soluble in water (deep blue) and ethanol
H₂SO₄ conc. — bluish black; on dilution — dull violet
Aqueous solution + HCl conc. — navy blue to violet ppt;
+ NaOH conc. — reddish violet, ppt.

34210 C.I. Direct Blue 69 (Reddish navy)

3-Amino-1,5-naphthalenedisulfonic acid → 1-Naphthylamine
→ 1,7-Cleve's acid → (alk.) *N*-Phenyl J acid

Discoverers — W. A. Israel and R. Kothe 1900; H. Jordan 1913
Bayer Co., BP 3673/00; USP 658897; FP 297506; GP 121868
(Fr. 6, 950)
FIAT 764 — Siriuslichtblau BR

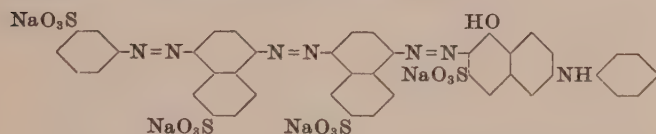
Soluble in water (blue)
Slightly soluble in ethanol (weak greyish violet)
H₂SO₄ conc. — greyish black; on dilution — violet
Aqueous solution + HCl conc. — dull blue ppt;
+ NaOH conc. — violet ppt.

34215 C.I. Direct Blue 81 (Blue)

O-Phenylsulfonyl H acid → 1-Naphthylamine
→ 1,7-Cleve's acid → (alk.) *N*-Phenyl J acid;
finally hydrolyse the *O*-phenylsulfonyl group

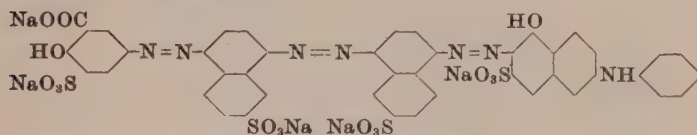
Discoverers — L. Hesse and O. Günther 1907
Bayer Co., BP 5484/08; FP 380540; GP 202117 (Fr. 9, 389)
FIAT 764 — Siriuslichtblau BL

Soluble in water (blue)
Insoluble in ethanol
H₂SO₄ conc. — bluish black; on dilution — blue
Aqueous solution + HCl conc. — dullish blue ppt;
+ NaOH conc. — blue ppt.

34220 C.I. Direct Blue 75 (Dull blue)

Metanilic acid → 1,6-Cleve's acid → 1,6-Cleve's acid
→ (alk.) *N*-Phenyl J acid

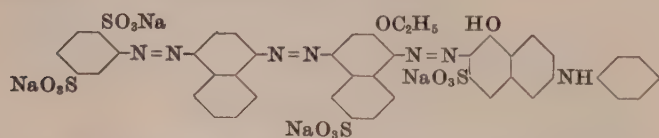
Soluble in water (blue)
H₂SO₄ conc. — dark green; on dilution — reddish brown to
reddish violet
Aqueous solution + HCl conc. — blue;
+ NaOH conc. — reddish violet

34225 Direct Dye

5-Amino-3-sulfosalicylic acid → 1,7-Cleve's acid
→ 1,6-Cleve's acid → (alk.) *N*-Phenyl J acid

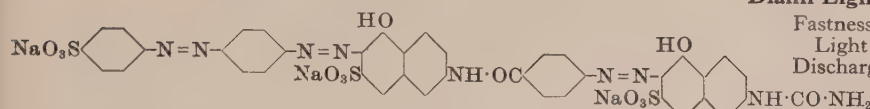
Discoverer — I.G.
Benzo Fast Chrome Blue FG (IG)
BIOS 961, 91; FIAT 764 — Benzoechtchromblau FG

Discoverer — H. Schweitzer 1925
I.G., BP 248230; USP 1602991; FP 598894; GP 450998 (Fr. 15, 521)
I.C.I., BP 374498
FIAT 764 — Siriusblau 6G
References to coupling in the presence of pyridine —
Pütter, Z. angew. Chem. 63 (1951), 188
Zollinger, Chem. Reviews, 51 (1952), 354; Helv. Chim. Acta, 38 (1955), 1597
Very soluble in water (blue)
Slightly soluble in ethanol
H₂SO₄ conc. — blue; on dilution — dull bluish green
Aqueous solution + HCl conc. — blue ppt;
+ NaOH conc. — violet blue

34230 C.I. Direct Blue 83 (Greenish blue)

2-Amino-*p*-benzenedisulfonic acid → 1-Naphthylamine
→ 5-Amino-6-ethoxy-2-naphthalenesulfonic acid
→ (alk.) *N*-Phenyl J acid

(Carry out the final coupling in aqueous pyridine medium with the addition of ammonia)

34250 Direct Dye (Bluish red)

p-(*p*-Aminophenylazo)benzenesulfonic acid
 → *N*-*p*-Aminobenzoyl J acid
 → 6-Ureido-1-naphthol-3-sulfonic acid

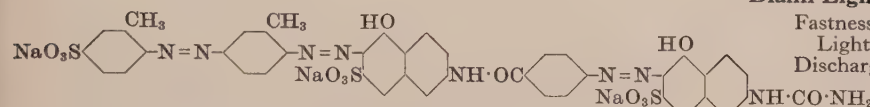
Discoverers — C. O. Müller and A. Otto 1906

Dianil Light Red 8BW (MLB)

Fastness Properties (C): Acid (organic) 2-3, Alkali 3-4,
 Light 4, 4, 4-5, Washing 2, Water 1
 Dischargeability, poor-fair

M.L.B., BP 9548/07; USP 888837; GP 205662 (Fr. 9, 395)
 FIAT 764 — Dianillichtrot BBW (error for 8BW)

Soluble in water (red)
 Slightly soluble in ethanol (pale orange red)
 H₂SO₄ conc. — blue; on dilution — salmon colour
 Aqueous solution + HCl conc. — reddish orange brown;
 + NaOH conc. — reddish brown

34255 Direct Dye

4-(4-Amino-*m*-tolylazo)-*m*-toluenesulfonic acid
 → *N*-*p*-Aminobenzoyl J acid
 → 6-Ureido-1-naphthol-3-sulfonic acid

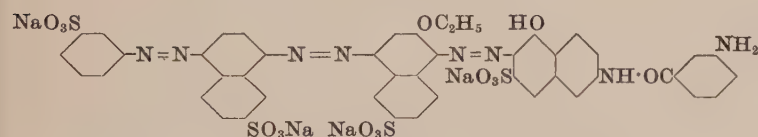
Discoverers — C. O. Müller and A. Otto 1906

Dianil Light Red 12BW (MLB)

Fastness Properties (C): Acid (organic) 2-3, Alkali 3-4,
 Light 4, 4, 4-5, Washing 2, Water 1-2
 Dischargeability, good

M.L.B., BP 9548/07; USP 888837; GP 205662 (Fr. 9, 395)

Soluble in water (wine red)
 Slightly soluble in ethanol
 H₂SO₄ conc. — blue; on dilution — reddish brown
 Aqueous solution + HCl conc. — red brown ppt;
 + NaOH conc. — corinth ppt.

34260 C.I. Direct Green 51 (Dull green)*

Metanilic acid → 1,7-Cleve's acid
 → 5-Amino-6-ethoxy-2-naphthalenesulfonic acid
 → *N*-*m*-Aminobenzoyl J acid

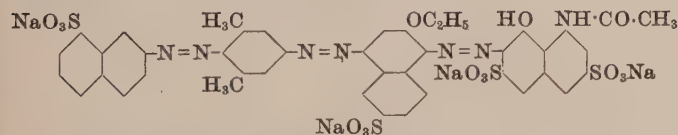
(Carry out the final coupling in aqueous pyridine medium with the addition of ammonia)

* Developed with methylphenylpyrazolone

Discoverer — H. Schweitzer 1926

I.G., USP 1749513; FP 287232; GP 476080 (Fr. 15, 996)
 FIAT 764 — Diazolichtgruen GFL

Soluble in water (greenish blue)
 Very slightly soluble in ethanol
 H₂SO₄ conc. — bluish black; on dilution — bluish green
 Aqueous solution + HCl conc. — bluish green ppt;
 + NaOH conc. — dull blue ppt.

34270 C.I. Direct Green 33 (Green)

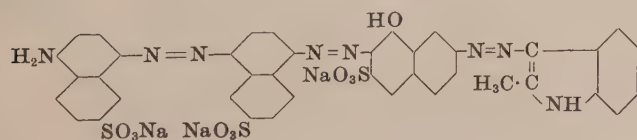
7-Amino-1-naphthalenesulfonic acid
 → 3,5-Xylidine → 5-Amino-6-ethoxy-2-naphthalenesulfonic acid
 → *N*-Acetyl H acid

(Carry out the final coupling in aqueous pyridine medium with the addition of sodium bicarbonate)

Discoverer — H. Clingstein 1927

I.G., BP 308958; USP 1701717; FP 646679; GP 481642 (Fr. 16, 995)
 BIOS 1548, 136; FIAT 764 — Siriuslichtgruen BB

Soluble in water (green)
 Very slightly soluble in ethanol
 H₂SO₄ conc. — violet grey brown; on dilution — green
 Aqueous solution + HCl conc. — dullish green ppt;
 + NaOH conc. — green

34280 C.I. Direct Green 43 (Dull bluish green → Bluish grey)*

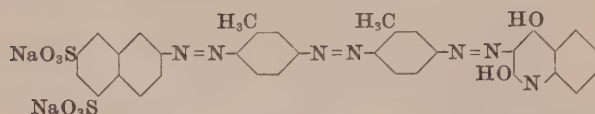
5-Acetamido-8-amino-2-naphthalenesulfonic acid
 → 1,6-Cleve's acid → (alk.) Gamma acid → 2-Methylindole;
 and finally hydrolyse the acetamido group

* Developed with 2-naphthol

Discoverers — H. Jordan and W. Neelmeier 1911

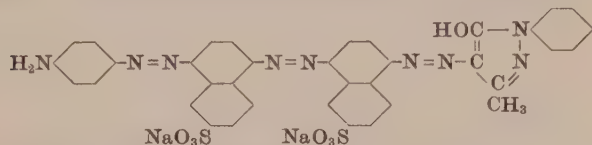
Bayer Co., BP 5955/11; USP 1024080; FP 440000; GP 243122
 (Fr. 10, 892)
 FIAT 764 — Diazolichtgruen GL

Soluble in water (dull greenish grey-blue)
 Very slightly soluble in ethanol
 H₂SO₄ conc. — greyish black; on dilution — greyish violet
 Aqueous solution + HCl conc. — bluish black ppt;
 + NaOH conc. — reddish blue black, ppt.

34285 Direct Dye

6-Amino-1,3-naphthalenedisulfonic acid \rightarrow *m*-Toluidine
 \rightarrow *m*-Toluidine \rightarrow 2,4-Quinolinediol

Discoverer — I.G.
Sirius Supra Brown RD (IG)
 FIAT 1313, 3, 186

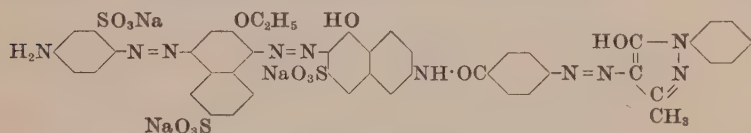
34290 C.I. Direct Blue 135 (Reddish blue \rightarrow Reddish navy)*

p-Aminooxanilic acid \rightarrow 1,6-Cleve's acid \rightarrow 1,6-Cleve's acid
 \rightarrow 3-Methyl-1-phenyl-5-pyrazolone;
 and finally hydrolyse the oxamic acid group

* Developed with 2-naphthol

Discoverer — H. Jordan 1910
 Bayer Co., BP 974/11; USP 999797; FP 428289; GP 247308
 (Fr. 10, 883)
 FIAT 764 — Diazoindigoblau 3RL
 BIOS 1548, 178

Soluble in water (violet black) and ethanol (violet)
 H₂SO₄ conc. — dull green; on dilution — reddish to violet-brown
 Aqueous solution + HCl conc. — violet brown ppt;
 + NaOH conc. — corinth, ppt.

34295 C.I. Direct Green 50 (Dull yellowish green)*

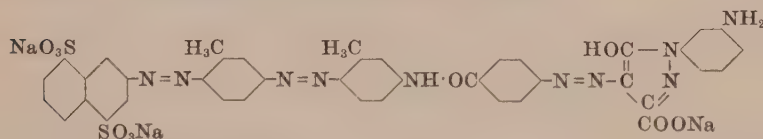
5-Acetamido-2-aminobenzenesulfonic acid
 \rightarrow 5-Amino-6-ethoxy-2-naphthalenesulfonic acid
 \rightarrow *N*-*p*-Aminobenzoyl J acid \rightarrow 3-Methyl-1-phenyl-5-pyrazolone
 and finally hydrolyse the acetamido group

(Carry out the second coupling in aqueous pyridine medium with the addition of ammonia)

* Developed with 2-naphthol

Discoverer — E. Fellmer 1925
 I.G., BP 259970; USP 1736905; FP 622974; GP 469288 (Fr. 15, 985)
 FIAT 764 — Diazogruen 3G

Soluble in water (yellowish green)
 Very slightly soluble in ethanol
 H₂SO₄ conc. — olive yellow; on dilution — pale green
 Aqueous solution + HCl conc. — yellowish green ppt;
 + NaOH conc. — olive green, ppt.

34300 Direct Dye (Bright yellowish orange)*

3-Amino-1,5-naphthalenedisulfonic acid \rightarrow *m*-Toluidine
 \rightarrow *m*-Toluidine;
 condense with *p*-nitrobenzoyl chloride and reduce the nitro group;
 \rightarrow 1-(*m*-Aminophenyl)-5-oxo-2-pyrazoline-3-carboxylic acid

* Developed with 2-naphthol. Developed with methylphenylpyrazolone the hue is bright reddish yellow

Discoverer — H. Roos 1938
Diazo Fast Orange 5G (IG)

Fastness Properties (C), developed with 2-naphthol:
 Acid (organic) 3, Alkali 3, Light 4, 4, 4-5,
 Washing 4-5, Water 4-5
 Developed with methylphenylpyrazolone:
 Acid (organic) 3, Alkali 3, Light 4, 4-5, 5, Wash-
 ing 4-5, Water 4-5

I.G., USP 2234580; FP 872818; GP 710502 (Fr.-Bayer, I-1, 1021)
 FIAT 764 — Diazolichtorange 5G

Very soluble in water (brownish orange)
 Soluble in ethanol (golden yellow)
 H₂SO₄ conc. — dark blue; on dilution — weak olive yellow
 Aqueous solution + HCl conc. — brownish olive ppt;
 + NaOH conc. — orange brown ppt.

TRISAZO DYES — V

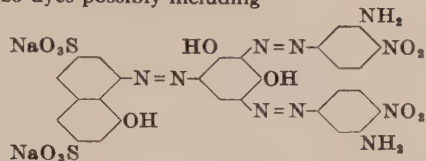


The structural formulae given for these dyes must be considered as conjectural only. None of the dyes is likely to be homogeneous.

34900 C.I. Acid Brown 85 (Dark brown)*

FIAT 764 — Igenalbraun CT

A mixture of azo dyes possibly including



[H acid \rightarrow (1) Resorcinol] (2) \Leftarrow 4-Nitro-*m*-phenylenediamine (2 mol.)

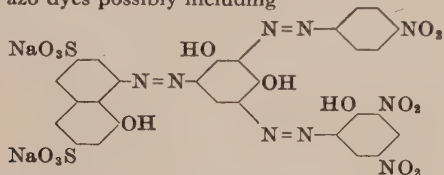
(The above formula is that shown in the process for Igenalbraun CT)

* On leather

34905 C.I. Acid Brown 75 (Dull reddish brown)*

FIAT 764 — Igenalbraun CR, Saeurelederbraun ER

A mixture of azo dyes possibly including



[H acid \rightarrow (1) (*weakly alk.*) Resorcinol] \leftarrow (*weakly alk.*) (2) Picramic acid
 \leftarrow (*weakly mineral acid*) (3) *p*-Nitroaniline

(The above formula corresponds to that shown in the process for Igenalbraun CR with the picramic acid structure corrected)

* On leather

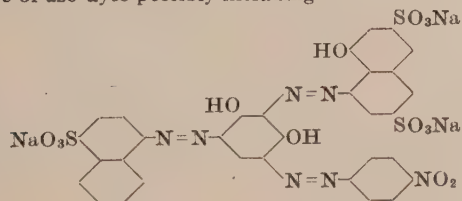
34906 C.I. Acid Brown 216 (Dull reddish brown)

FIAT 764 — Erganildunkelbraun T

Iron complex derived from C.I.34905

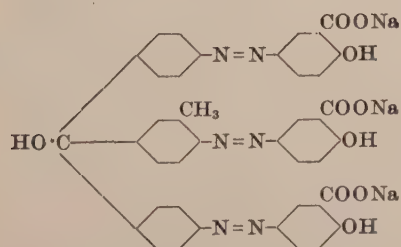
34907 C.I. Acid Brown 214 (Brown)

A mixture of azo dyes possibly including



[Naphthionic acid (1) \rightarrow Resorcinol] \leftarrow (2) H acid
 \leftarrow (3) *p*-Nitroaniline

34950 Mordant Dye



Magenta (C.I.42510) \rightarrow Salicylic acid (3 mol.)

Discoverer — P. Julius 1890

Alizarine Yellow FS (DH)

Badische Co., GP 58893 (*Fr.* 3, 645)

Meldola, *JCS*, 47 (1885), 668

Brandt, *Bull. Soc. Ind. Mulhouse*, 64 (1898), 115

Sircar and Watson, *JSCI*, 31 (1912), 968

Insoluble in water

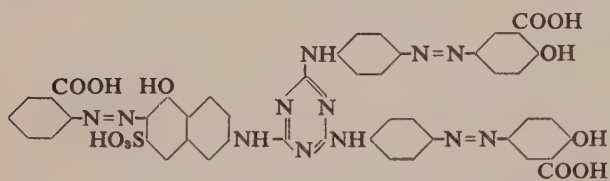
Very slightly soluble in ethanol

H₂SO₄ conc. — green; on dilution — brown ppt.

Alcoholic solution + HCl — brown ppt;

+ NaOH — orange yellow solution

34960 C.I. Direct Orange 94 (*Dull yellowish orange*)



Condense Cyanuric chloride with C.I. 14045 (2 mol) and [Anthranilic acid→J acid] (1 mol)

Panchartek, Allan and Mužík, *Coll. Czech. Chem. Commun.*,
25 (1960) 2783

NOTES

TETRAKISAZO DYES AND AZO DYES OF GREATER COMPLEXITY

The polyazo dyes which form this series must in many cases be mixed products and the formulae given must be accepted with reserve as representing no more than probable major components.

The dyes are Direct and Leather dyes predominantly of black or dark brown hue.

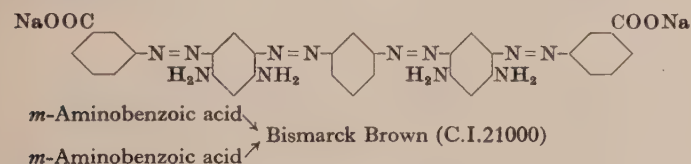
The following are the general formulae in the order of presentation of the dyes —

| C.I. Numbers | Formula | No. of Dyes Contained |
|--------------|--|-----------------------|
| 35000-35130 | $A \rightarrow Z \leftarrow D \rightarrow Z' \leftarrow A'$ | 18 |
| 35200-35315 | $E \leftarrow D \rightarrow Z \leftarrow D' \rightarrow E'$ | 18 |
| 35400-35465 | $E \leftarrow M \leftarrow D \rightarrow M' \rightarrow E'$ | 11 |
| 35500-35545 | $E \leftarrow D \rightarrow M \rightarrow M' \rightarrow E'$ | 7 |
| 35600 | $A \rightarrow Z \leftarrow D \rightarrow M \rightarrow E$ | 1 |
| 35650-35680 | $A \rightarrow M \rightarrow Z \leftarrow D \rightarrow E$ | 4 |
| 35700-35730 | $E \leftarrow D \rightarrow M \rightarrow Z \leftarrow A$ | 5 |
| 35750-35790 | $A \rightarrow M \rightarrow Z \leftarrow M' \leftarrow A'$ | 7 |
| 35800-35810 | $A \rightarrow M \rightarrow M' \rightarrow Z \leftarrow A'$ | 2 |
| 35850-35870 | $A \rightarrow M \rightarrow M^1 \rightarrow M^2 \rightarrow E$ | 4 |
| 35900 | $E \leftarrow D \rightarrow M \text{ (and } D) \begin{matrix} \nearrow E^1 \\ \searrow E^2 \end{matrix}$ | 1 |
| 36000-36350 | Dyes with 5 or more azo groups | 14 |
| | TOTAL | 92 |

Dyes of General Formula: $A \rightarrow Z \leftarrow D \rightarrow Z' \leftarrow A'$

35000 Direct Dye

Probably a heterogeneous product with the following as a major constituent



Discoverers — R. Gnehm and J. Schmid 1891

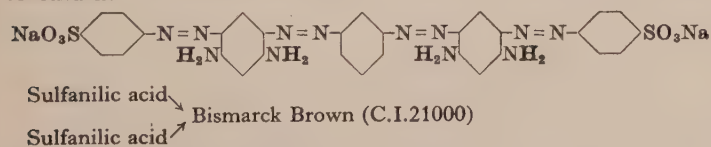
Direct Brown J, JP (Ciba)

Ciba, USP 491422; FP 219925; GP 76127 (Fr. 3, 746)

Soluble in water (yellowish brown)
 Slightly soluble in ethanol
 H_2SO_4 conc. — brown; on dilution — brown ppt.
 Aqueous solution + HCl — dark brown ppt;
 + NaOH — unaltered

35005 C.I. Direct Brown 44 (Brown)

Probably a heterogeneous product with the following as a major constituent



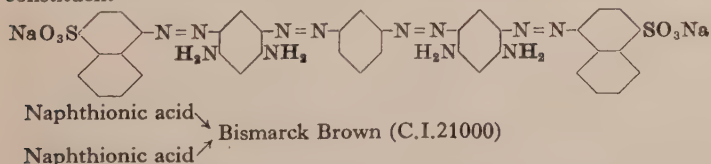
Discoverer — M. Herzberg 1887

Bayer Co., BP 16493/87; USP 384315; GP 46804 (Fr. 2, 362)

Soluble in water (brown)
 Very slightly soluble in ethanol and acetone
 H_2SO_4 conc. — brown to black; on dilution — orange brown, fine ppt.
 Aqueous solution + NaOH (10%) — redder, stronger

35010 C.I. Direct Brown 44 (Brown)

Probably a heterogeneous product with the following as a major constituent



Discoverer — M. Herzberg 1887

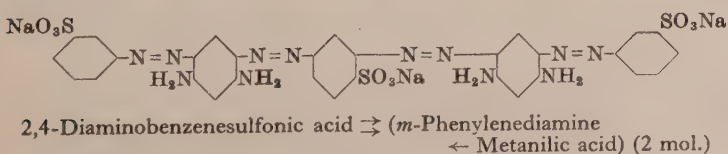
Bayer Co., BP 16493/87; USP 384315; FP 187379; GP 46804 (Fr. 2, 362)

FIAT 764 — Benzobraun BM

Soluble in water and ethanol (orange brown)
 H_2SO_4 conc. — brownish black; on dilution — yellowish brown
 Aqueous solution + HCl conc. — brown, ppt;
 + NaOH conc. — orange brown, ppt.

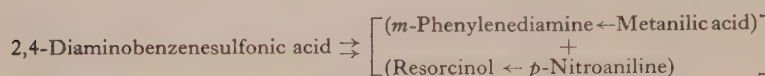
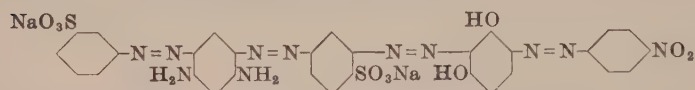
Note — In some brands naphthionic acid may be replaced by other aminonaphthalenesulfonic acids

35020 C.I. Acid Brown 120 (Reddish brown)*



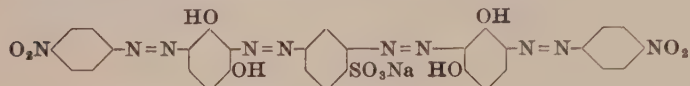
Soluble in water (yellowish brown)
 H_2SO_4 conc. — dark brown; on dilution — brownish yellow
 Aqueous solution + HCl conc. — brown ppt;
 + NaOH conc. — orange brown

* On leather

35025 C.I. Acid Brown 119 (Brown)*

* On leather

Soluble in water (yellowish brown)

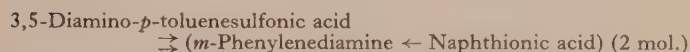
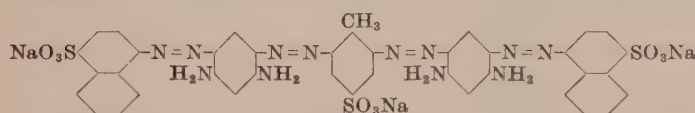
 H_2SO_4 conc. — yellowish brown; on dilution — yellowish brown, ppt.Aqueous solution + HCl conc. — yellowish brown, ppt;
+ NaOH conc. — bluish red**35030 C.I. Acid Brown 123 (Yellowish brown)***

* On leather

Soluble in water (yellowish brown)

 H_2SO_4 conc. — brownish orange; on dilution — yellowish brown, ppt.

Aqueous solution + HCl conc. — brownish yellow ppt.

35040 C.I. Direct Brown 63

Discoverer — C. Rudolph 1889

Oehler, *BP* 11000/89; *USP* 465116; *FP* 199658; *GP* 58657 (*Fr.* 3, 738)*FIAT* 764 — Toluylenbraun WR ex. kz.

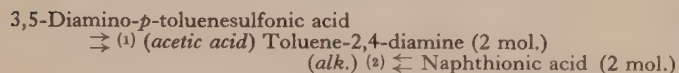
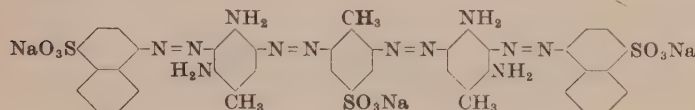
Very soluble in water (orange brown)

Moderately soluble in ethanol (yellowish brown)

 H_2SO_4 conc. — corinth (+ blue); on dilution — orange brown

Aqueous solution + HCl conc. — orange brown, ppt;

+ NaOH conc. — orange brown

35045 Direct Dye

Discoverer — C. Rudolph 1889

Toluylene Brown R (By)Fastness Properties (C): Acid (organic) 4, Alkali 5,
Light 2, Washing 1-2, Water 2Oehler, *BP* 11000/89; *USP* 465116; *FP* 199658; *GP* 58657 (*Fr.* 3, 738)*FIAT* 764 — Toluylenbraun R

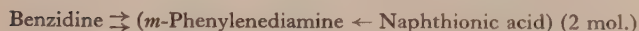
Very soluble in water (orange brown)

Slightly soluble in ethanol (weak yellowish brown)

 H_2SO_4 conc. — bordeaux (+ blue); on dilution — orange brown

Aqueous solution + HCl conc. — orange brown, ppt;

+ NaOH conc. — orange brown

35060 C.I. Direct Brown 39 (Reddish brown)Bayer Co., *BP* 16493/87; *FP* 187379; *GP* 44954, 49138 (*Fr.* 2, 356, 357)Ruggli & Fischer, *Helv. Chim. Acta*, 28 (1945), 1270

Soluble in water (reddish brown)

 H_2SO_4 conc. — reddish violet; on dilution — brown ppt.

Aqueous solution + HCl — brown ppt;

+ NaOH — unaltered

35065 Direct Dye

Discoverer — F. Bender 1889

Hessian Brown BBN, O (L)

May be aftertreated with copper sulfate

Leonhardt Co., *GP ap.* L5179 (*Fr.* 2, 372)

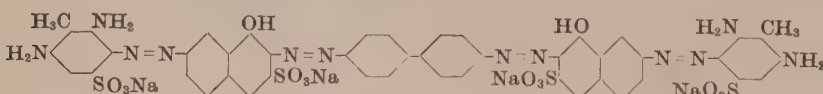
Soluble in water (brown)

Slightly soluble in ethanol

 H_2SO_4 conc. — violet black; on dilution — brown ppt.

Aqueous solution + HCl — brown ppt;

+ NaOH — deep red solution

35070 Direct Dye

Discoverer — Oehler

Toluylene Black G 40 (By)Fastness Properties (C): Acid (organic) 2,
Alkali 4, Light 2, Washing and Water 2*FDX* 885 — Toluylen-schwarz G40

Soluble in water (blue black)

Very slightly soluble in ethanol (violet to greyish brown)

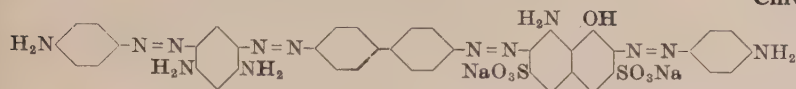
 H_2SO_4 conc. — deep blue; on dilution — greyish violet

Aqueous solution + HCl conc. — blue black, ppt;

+ NaOH conc. — bordeaux

35075 C.I. Direct Black 34 (Greenish black)

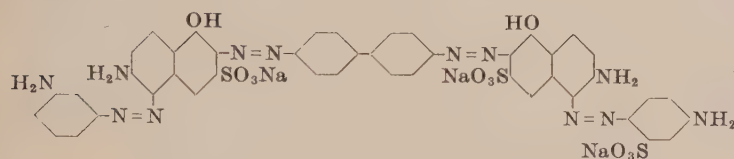
Discoverer — G. Wolfsleben 1926

Chrome Leather Black A (IG)I.G., BP 300722 FP 640225; GP 469946 (Fr. 16, 1001)
FIAT 764 — Chromlederschwarz A kz.

Benzidine \rightarrow ⁽²⁾ *m*-Phenylenediamine ⁽³⁾ \leftarrow *p*-Aminoacetanilide
⁽¹⁾ (acid) H acid (alk.) ⁽³⁾ \leftarrow *p*-Aminoacetanilide
 and finally hydrolyse the amide groups

35080 Direct Dye (Reddish navy)*

Discoverer — Oehler

Diazo Navy Blue R (By)Dischargeability, developed with 2-naphthol, fairly good
FIAT 764 — Diazomarineblau R

Benzidine \rightarrow ⁽²⁾ (alk.) [J acid (acid) \leftarrow *m*-Nitroaniline]
⁽¹⁾ (alk.) [J acid (acid)
 \leftarrow 2-Amino-5-nitrobenzenesulfonic acid]

and reduce the nitro groups

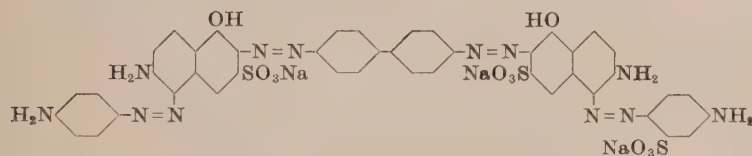
* Developed with 2-naphthol

Soluble in water (dark corinth)
 Slightly soluble in ethanol
 H₂SO₄ conc. — dark blue; on dilution — corinth
 Aqueous solution + HCl conc. — blackish violet, ppt;
 + NaOH conc. — dark corinth, ppt.

35085 C.I. Direct Blue 131 (Navy)*

Discoverer — Oehler

FIAT 764 — Diazomarineblau BP 25



Benzidine \rightarrow ⁽²⁾ (alk.) [J acid (acid) \leftarrow *p*-Nitroaniline]
⁽¹⁾ (alk.) [J acid (acid)
 \leftarrow 2-Amino-5-nitrobenzenesulfonic acid]

and reduce the nitro groups

* Developed with 2-naphthol

Soluble in water (dark corinth)
 Slightly soluble in ethanol
 H₂SO₄ conc. — dark blue; on dilution — corinth
 Aqueous solution + HCl conc. — dark corinth, ppt;
 + NaOH conc. — dark corinth, ppt.

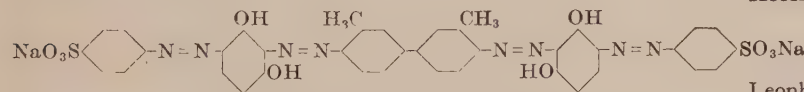
35100 Direct Dye

Discoverer — F. Bender 1889

Hessian Brown MM (L)

Fastness Properties: Acid and alkali, good; Light and washing, moderate. Light fastness improved by aftertreatment with copper sulfate

Leonhardt Co., GP ap. L5179 (Fr. 2, 372)

*o*-Tolidine \rightleftharpoons (Resorcinol \leftarrow Sulfanilic acid) (2 mol.)

Soluble in water (brown)
 Slightly soluble in ethanol
 H₂SO₄ conc. — violet black; on dilution — brown
 Aqueous solution + HCl — brown ppt;
 + NaOH — reddish brown

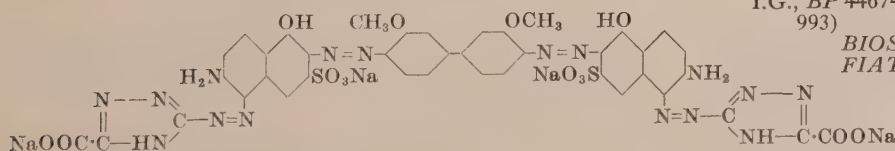
35110 C.I. Direct Blue 150 (Navy)*

Discoverers — C. Taube and J. H. Helberger 1934

I.G., BP 446746; USP 2095484; FP 796273; GP 651105 (Fr. 24, 993)

BIOS 1548, 115

FIAT 764 — Benzoetkuffermarineblau RL



o-Dianisidine \rightleftharpoons (alk.) [J acid (acid)
 \leftarrow 5-Amino-4*H*-1,2,4-triazole-3-carboxylic acid] (2 mol.)

Soluble in water (navy blue)
 Slightly soluble in ethanol
 H₂SO₄ conc. — bluish green; on dilution — dark blue
 Aqueous solution + HCl conc. — navy blue, ppt;
 + NaOH conc. — dark violet

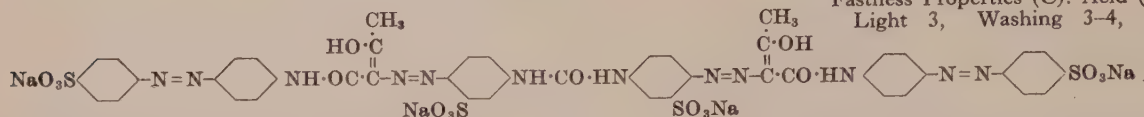
* Aftertreated with copper sulfate

35120 Direct Dye

Discoverers — A. Sieglitz and M. Reuter 1939

Dianil Yellow GW (IG)

Fastness Properties (C): Acid (organic) 4, Alkali 5,
Light 3, Washing 3-4, Water 3



5,5'-Ureylenebis(2-aminobenzenesulfonic acid)

→ *p*-[*p*-(*α*-Acetylacetamido)phenylazo]benzenesulfonic acid (2 mol.)

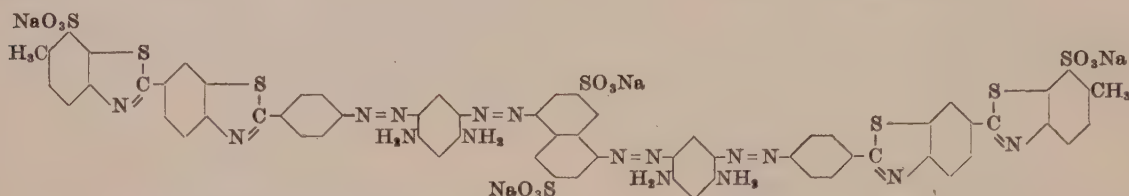
Dischargeability: neutral, poor; alkaline, fairly good-good

I.G., GP 722908 (Fr.-Bayer, I-1, 1047)

BIOS. MISC. 20, Appendix 76 (preparation and properties)

35130 Direct Dye

Discoverer — Cassella Co.



4,8-Diamino-2,6-naphthalenedisulfonic acid

→ [*m*-Phenylenediamine ← Primuline (C.I.49000)] (2 mol.)

Diamine Nitrazol Brown G (C)

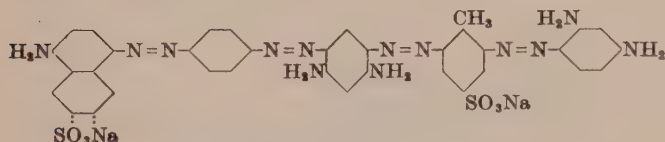
Fastness Properties (C), coupled with diazotised
p-nitroaniline: Acid (organic) 4, Alkali 5, Light 2,
Washing 3, Water 4
Dischargeability, poor

H₂SO₄ conc. — reddish bordeaux; on dilution — brown
Aqueous solution + HCl conc. — dark brown, heavy ppt;
+ NaOH conc. — reddish brown, heavy ppt.

FIAT 764 — Diaminnitrazolbraun G
Soluble in water (reddish orange to brown)
Slightly soluble in ethanol (orange brown)

Dyes of General Formula: E ← D → Z ← D' → E'
35200 Direct Dye
Paranil Brown B70 (By)

Fastness Properties (C), coupled with diazotised
p-nitroaniline: Acid (organic) 3, Alkali 4, Light 1,
Washing 3, Water 3-4
Dischargeability, fairly good

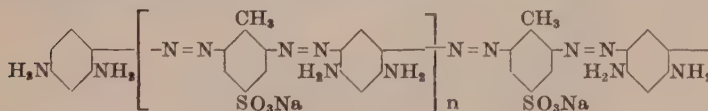


p-Nitroaniline → 1,6 (and 1,7)-Cleve's acid
→ [3,5-Diamino-*p*-toluenesulfonic acid → *m*-Phenylenediamine (2 mol.)]
reduce nitro group

Soluble in water (dark brown) and ethanol (olive brown)
H₂SO₄ conc. — grey black; on dilution — olive brown
Aqueous solution + HCl conc. — olive brown to grey, ppt;
+ NaOH conc. — dark brown, ppt.

35205 Direct Dye

A mixed dye of which the components probably conform to the general formula



3,5-Diamino-*p*-toluenesulfonic acid (2 mol.)

→ *m*-Phenylenediamine (3 mol.)

Discoverer — C. Rudolph

Toluylen Brown G (By)

Fastness Properties (C): Acid (organic) 3-4, Alkali 4-5,
Light 2, Washing 1-2, Water 2

Oehler, BP 17546/92; USP 516380; GP 65863 (Fr. 3, 740)

FIAT 764 — Toluylenbraun G ex. kz.

Kallab & Rudolph, Chemikerztg. 14 (1890), 1731

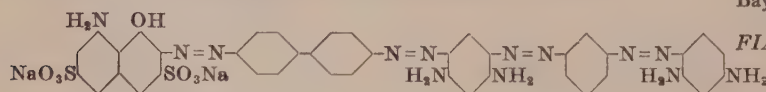
Ruggli & Fischer, Helv. Chim. Acta, 28 (1905), 445

Soluble in water (yellowish brown) and in ethanol
H₂SO₄ conc. — brownish red; on dilution — yellowish brown
Aqueous solution + HCl conc. — brown, ppt;
+ NaOH conc. — orange brown, ppt.

35210 C.I. Direct Brown 127 (Blackish brown (reddish)) *

Discoverers — M. Ulrich, J. Bammann, and M. Herzberg 1891
Bayer Co., BP 13443/90; USP 515381; FP 210033; GP 84079
(Fr. 4, 925)

FIAT 764 — Diazobraun G



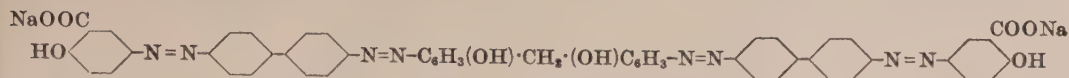
Benzidine → (1) (alk.) H acid
Bismarck Brown (C.I.21000)

Moderately soluble in water (violet black)
Very slightly soluble in ethanol (pale violet brown)
H₂SO₄ conc. — bluish black; on dilution — pale violet brown
Aqueous solution + HCl conc. — corinth;
+ NaOH conc. — corinth

* Developed with 2-naphthol

35220 Direct Dye

Discoverer — J. Brack 1893



Salicylic acid (2 mol.) $\xrightarrow{(1)}$ Benzidine (2 mol.)
 $\xrightarrow{(2)}$ 4,4'-Methylenediphenol

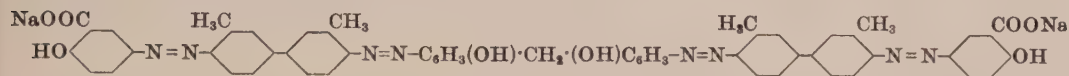
Mekong Yellow G (DH)

Durand & Huguenin, *BP* 8511/93; *USP* 519523; *FP* 228593;
GP 80816 (*Fr.* 5, 957)

Soluble in water (yellowish brown)
 H_2SO_4 conc. — violet; on dilution — brown ppt.
 Aqueous solution + HCl — brown ppt;
 + NaOH — reddish brown

35225 Direct Dye

Discoverer — J. Brack 1893



Salicylic acid (2 mol.) $\xrightarrow{(1)}$ *o*-Tolidine (2 mol.)
 $\xrightarrow{(2)}$ 4,4'-Methylenediphenol

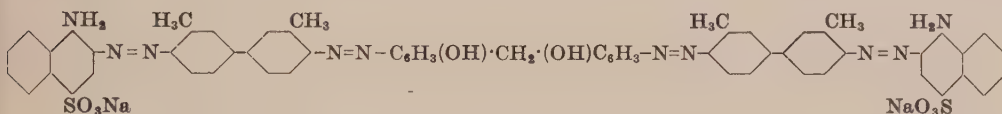
Mekong Yellow R (DH)

Patents as for C.I.35220

Soluble in water (yellowish brown)
 H_2SO_4 conc. — bluish violet; on dilution — blackish brown ppt.
 Aqueous solution + HCl — dark brown ppt;
 + NaOH — redder

35230 Direct Dye

Discoverer — J. Brack 1893



Naphthionic acid (2 mol.) $\xrightarrow{(1)}$ *o*-Tolidine (2 mol.)
 $\xrightarrow{(2)}$ 4,4'-Methylenediphenol

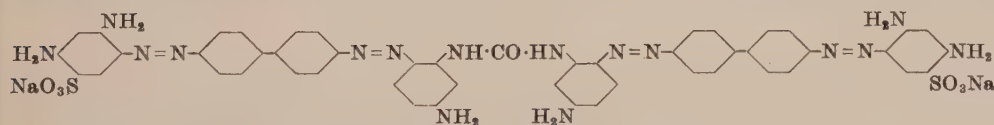
Azo Orange R (DH)

Durand & Huguenin, *BP* 8511/93; 9182/93; *USP* 516468,
 519523; *FP* 226107, 228593; *GP* 71377, 79082, (*Fr.* 3, 722,
 703)

Soluble in water (brownish yellow)
 H_2SO_4 conc. — blue; on dilution — dark grey ppt.
 Aqueous solution + HCl — dark grey ppt;
 + NaOH — redder

35240 Direct Dye

Discoverers — M. Kahn and A. Ossenbeck 1911



2,4-Diaminobenzenesulfonic acid (2 mol.) $\xrightarrow{(1)}$ Benzidine (2 mol.)
 $\xrightarrow{(2)}$ 3,3'-Diaminocarbanilide

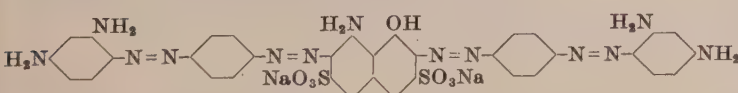
Diazo Brown NR (By)

Bayer Co., *BP* 2797/11; *USP* 1025984; *FP* 437939; *GP* 251348
 (*Fr.* 11, 414)

Moderately soluble in water (olive brown)
 Slightly soluble in ethanol
 H_2SO_4 conc. — deep reddish blue; on dilution — corinth
 Aqueous solution + HCl conc. — corinth, ppt;
 + NaOH conc. — yellowish brown, ppt.

35255 C.I. Direct Black 19 (Greenish black)

Discoverer — Kalle Co. 1910



p-Nitroaniline $\xrightarrow{(3)}$ reduce nitro group \rightarrow (4) *m*-Phenylenediamine
 $\xrightarrow{(1) \text{ (acid)}}$ H acid
 $\xrightarrow{(2) \text{ (alk.)}}$ H acid
p-Nitroaniline $\xrightarrow{(3)}$ reduce nitro group \rightarrow (4) *m*-Phenylenediamine

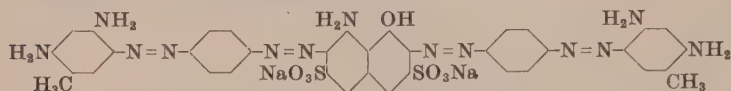
Agfa, *BP* 2196/96; *FP* 245557; *GP* 84390 (*Fr.* 4, 1002)
FIAT 764 — Columbiaeichschwarz G ex.

Soluble in water (greenish black)
 Slightly soluble in ethanol and acetone
 H_2SO_4 conc. — greenish black; on dilution — reddish black ppt.
 HNO_3 conc. — dark brown
 Aqueous solution + H_2SO_4 10% — slightly redder;
 + NaOH conc. — greenish blue

35256 Direct Dye**Diamine Aldehyde Black KBF (C)**

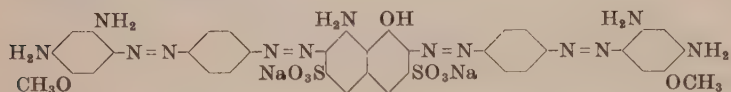
Mixture with C.I.35255 in which part of the H acid is replaced by
 K acid

FIAT 764 — Diaminaldehydschwarz KBF

35260 C.I. Direct Black 28 (Black)FIAT 764 — Columbiaeichschwarz V ex. Kunstseidenschwarz R.
Tinteneichschwarz A ex.

p-Nitroaniline $\xrightarrow{(3) \text{ reduce nitro group}}$ (4) Toluene-2,4-diamine
 $\xrightarrow{(1) \text{ (acid)}}$ H acid
 $\xrightarrow{(2) \text{ (alk.)}}$ H acid
p-Nitroaniline $\xrightarrow{(3) \text{ reduce nitro group}}$ (4) Toluene-2,4-diamine

Soluble in water (bluish black)
 Slightly soluble in ethanol (green)
 H₂SO₄ conc. — bluish green; on dilution — blue ppt.
 Aqueous solution + HCl — blue ppt;
 + NaOH — greenish blue

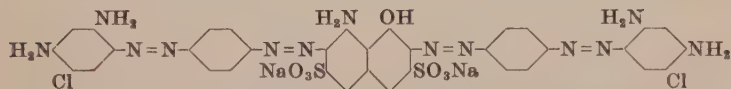
35265 Direct Dye**Artificial Silk Black A (IG)**

p-Nitroaniline $\xrightarrow{(3) \text{ reduce nitro group}}$ (4) 4-Methoxy-*m*-phenylenediamine
 $\xrightarrow{(1) \text{ (acid)}}$ H acid
 $\xrightarrow{(2) \text{ (alk.)}}$ H acid
p-Nitroaniline $\xrightarrow{(3) \text{ reduce nitro group}}$ (4) 4-Methoxy-*m*-phenylenediamine

Fastness Properties (C), on cotton: Acid (organic) 3,
 Alkali 5, Light 3-4, Washing 1-2, Water 2-3,
 Dischargeability: neutral and alkaline, fairly good
 FIAT 764 — Kunstseidenschwarz A

35270 Direct Dye**Diamine Fast Black XCD (C)**

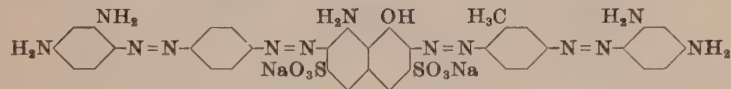
FIAT 764 — Diamineichschwarz XCD



p-Nitroaniline $\xrightarrow{(3) \text{ reduce nitro group}}$ (4) 4-Chloro-*m*-phenylenediamine
 $\xrightarrow{(1) \text{ (acid)}}$ H acid
 $\xrightarrow{(2) \text{ (alk.)}}$ H acid
p-Nitroaniline $\xrightarrow{(3) \text{ reduce nitro group}}$ (4) 4-Chloro-*m*-phenylenediamine

35275 Direct Dye**Diamine Fast Black XT (C)**

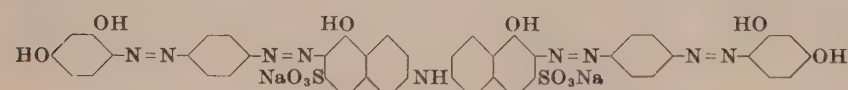
FIAT 764 — Diamineichschwarz XT



p-Nitroaniline $\xrightarrow{(3) \text{ reduce nitro group}}$ (4) *m*-Phenylenediamine
 $\xrightarrow{(1) \text{ (acid)}}$ H acid
 $\xrightarrow{(2) \text{ (alk.)}}$ H acid
 4-Nitro-*o*-toluidine $\xrightarrow{(3) \text{ reduce nitro group}}$ (4) *m*-Phenylenediamine

35290 Direct Dye

Discoverers — A. Blank, C. Heidenreich, and J. Jansen 1912



p-Aminoformanilide (2 mol.) $\xrightarrow{(1) \text{ 6,6'-Iminobis-1-naphthol-3-sulfonic acid}}$
 $\xrightarrow{(2) \text{ hydrolyse amide groups}}$ Resorcinol (2 mol.)

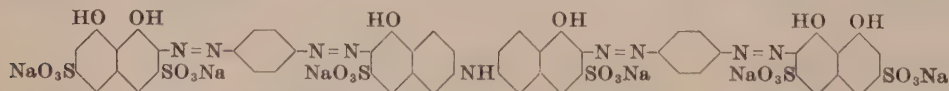
Benzofarm Blue B (By)

Bayer Co., BP 8767/13; USP 1090379; FP 456675;
 GP 274489 (Fr. 12, 3531)
 FIAT 764 — Benzofarmblau B

Soluble in water (violet)
 Almost insoluble in ethanol
 H₂SO₄ conc. — violet black; on dilution — dullish violet
 Aqueous solution + HCl conc. — dull violet ppt;
 + NaOH conc. — dull bluish violet ppt.

35295 Direct Dye

Discoverers — A. Blank and W. Bergdolt 1911



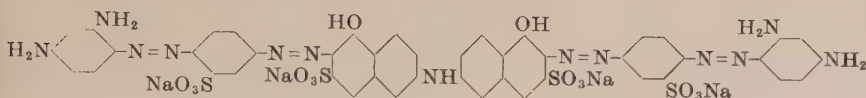
[*p*-Nitroaniline $\xrightarrow{(1) \text{ Chromotropic acid}}$ (2 mol.) $\xrightarrow{(2) \text{ reduce nitro group}}$ 6,6'-Iminobis-1-naphthol-3-sulfonic acid]

Union Blue R (By)

Fastness Properties (C), on cotton: Acid (organic) 4,
 Alkali 5, Light 3, Washing 1-2, Water 2
 For dyeing cotton/wool unions
 Bayer Co., BP 8184/13; USP 1082923, 1087429; FP 456432;
 GP ap. F34324 (Fr. 11, 436)

Soluble in water (navy blue) and in ethanol (reddish blue)

H₂SO₄ conc. — blue and yellow (bluish green); on dilution —
 dullish violet
 Aqueous solution + HCl conc. — dull violet ppt;
 + NaOH conc. — dullish violet

35300 Direct Dye

[4'-Amino-3'-sulfooxanilic acid
 (1) *m*-Phenylenediamine
 (2) *hydrolyse oxamic acid group*]

(2 mol.) \Rightarrow 6,6'-Imino-
 bis-1-naphthol-3-
 sulfonic acid

Discoverers — M. Kahn and A. Ossenbeck 1912

Para Black O extra conc. (By)

Fastness Properties (C), coupled with diazotised *p*-nitroaniline: Acid (organic) 5, Alkali 5, Light 2, Washing 3, Water 4

Dischargeability, fair-fairly good

Bayer Co., BP 8767/13; USP 1078926; FP 456675; GP 274489 (Fr. 12, 353)

Moderately soluble in water (dark reddish blue)

Slightly soluble in ethanol

H₂SO₄ conc. — dark blue; on dilution — violet

Aqueous solution + HCl conc. — bluish black, ppt;
 + NaOH conc. — violet black, ppt.

35310 Direct Dye

(1) 6,6'-Ureylenebis-1-naphthol-3-sulfonic acid
m-Aminoformanilide (2 mol.)
 (2) *hydrolyse amide groups* \rightarrow (3) Resorcinol (2 mol.)

Discoverers — A. Blank, C. Heidenreich, and J. Jansen 1912

Benzoform Red G (By)

Bayer Co., BP 8767/13; USP 1087430; FP 456675; GP 274489 (Fr. 12, 353)

FIAT 764 — Benzoformrot G

Moderately soluble in water (scarlet)

Very slightly soluble in ethanol (pale bluish violet)

H₂SO₄ conc. — reddish violet; on dilution — orange brown

Aqueous solution + HCl conc. — reddish orange brown, ppt;
 + NaOH conc. — reddish brown

35315 Direct Dye

[*p*-Nitroaniline (1) Chromotropic acid
 (2) *reduce nitro group*] (2 mol.) \Rightarrow 6,6'-Ureylenebis-
 1-naphthol-3-sulfonic acid

Discoverers — A. Blank and W. Bergdolt 1912

Union Blue G (By)

For dyeing cotton/wool unions

Bayer Co., BP 8184/13; USP 1082923, 1087429; FP 456432;
 GP ap. F34324 (Fr. 11, 436)

FIAT 764 — Halbwollblau G

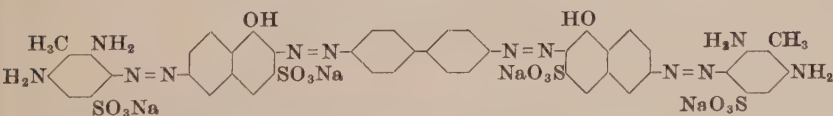
H₂SO₄ conc. — greenish blue; on dilution — dullish blue

Aqueous solution + HCl conc. — dark blue, ppt;

+ NaOH conc. — deep blue

Soluble in water (deep blue)

Insoluble in ethanol

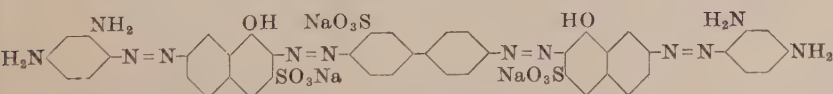
Dyes of General Formula: E ← M ← D → M' → E'**35400 Direct Dye**

Benzidine \Rightarrow (alk.) J acid (2 mol.)
 \Rightarrow 3,5-Diamino-*p*-toluenesulfonic acid (2 mol.)

Discoverer — J. Herbabny 1899

Triazol Indigo Blue (Gr E)

Oehler, USP 644291-2; GP 127447 (Fr. 6, 1012)

35410 Direct Dye

3-Sulfobenzidine \Rightarrow (alk.) Gamma acid (2 mol.)
 \Rightarrow *m*-Phenylenediamine (2 mol.)

Discoverer — F. Petersen 1896

Cuba Black (PS)

May be coupled with diazotised *p*-nitroaniline

Petersen & Co, Basle, BP 13743/96; USP 578580;
 FP 257245

Soluble in water

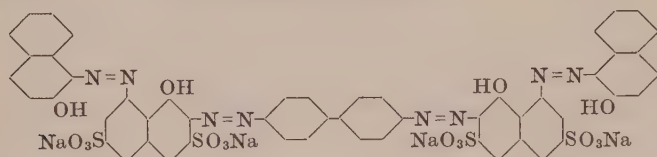
Insoluble in ethanol

H₂SO₄ conc. — dark blue; on dilution — blue ppt.

Aqueous solution + HCl — blue ppt;

+ NaOH — ppt.

35415 C.I. Direct Black 100 (Bluish grey)

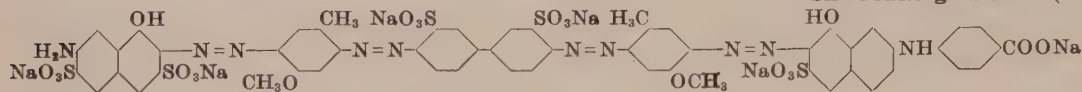


Benzidine \Rightarrow (alk.) H acid (2 mol.) \Rightarrow 2-Naphthol (2 mol.)

35420 C.I. Acid Black 4 (Reddish black)

Discoverers — E. Fellmer and H. Clingstein 1913

Silk Printing Black M (IG)



3,3'-Disulfobenzidine

\Rightarrow Cresidine (2 mol.) $\left\{ \begin{array}{l} \text{(alk.) 2R acid (1 mol.)} \\ \text{N-p-Carboxyphenyl Gamma acid (1 mol.)} \end{array} \right.$

I.G., BP 319407; USP 1747539; FP 657115; GP 498586, (Fr. 16, 1004)

FIAT 764 — Seidendruckschwarz M

Soluble in water (violet black)

Insoluble in ethanol

H₂SO₄ conc. — blue; on dilution — reddish blue

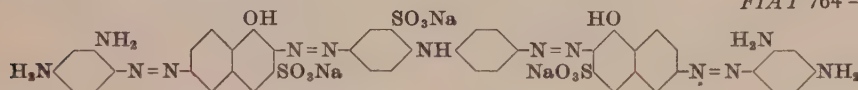
Aqueous solution + HCl conc. — dark blue;

+ NaOH conc. — bluish black

35430 Direct Dye

Cotonerol V Extra (IG)

FIAT 764 — Cotonerol V ex.

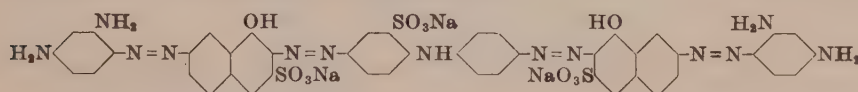


5-Amino-2-(p-aminoanilino)benzenesulfonic acid

\Rightarrow (alk.) J acid (2 mol.) \Rightarrow m-Phenylenediamine (2 mol.)

35435 C.I. Direct Black 22 (Greenish black)

FIAT 764 — Cotonerol A ex.



5-Amino-2-(p-aminoanilino)benzenesulfonic acid

\Rightarrow (alk.) Gamma acid (2 mol.) \Rightarrow m-Phenylenediamine (2 mol.)

Soluble in water (violet black)

H₂SO₄ conc. — violet black; on dilution — blackish brown ppt.

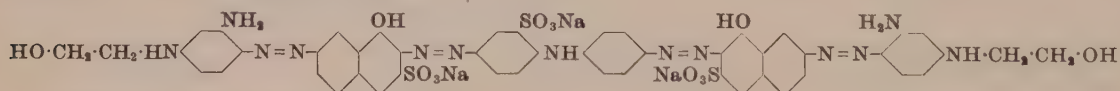
HNO₃ conc. — reddish brown ppt. and solution

Aqueous solution + HCl conc. — brownish black ppt;

+ NaOH conc. — dull bluish red

35440 C.I. Direct Black 32 (Black)

FIAT 764 — Cotonerol AB ex.



5-Amino-2-(p-aminoanilino)benzenesulfonic acid

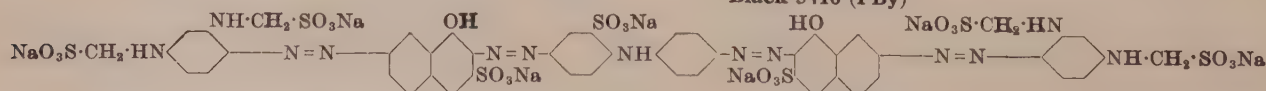
\Rightarrow (alk.) Gamma acid (2 mol.)

\Rightarrow 2-(m-Aminoanilino)ethanol (2 mol.)

35445 Food Dye

Discoverer — Farb. Bayer Co.

Black 5410 (FBy)



5-Amino-2-(p-aminoanilino)benzenesulfonic acid

\Rightarrow (alk.) Gamma acid (2 mol.)

\Rightarrow (m-Phenylenediimino)dimethanesulfonic acid (2 mol.)

Soluble in water (bluish black)

Insoluble in ethanol

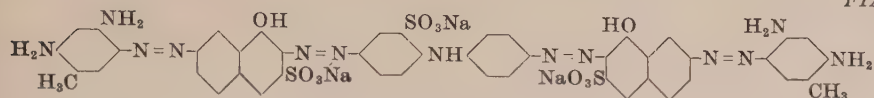
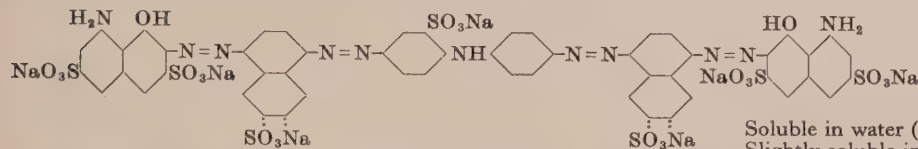
H₂SO₄ conc. — very dull dark brown; on dilution — dull violet blue

Aqueous solution + HCl conc. — bluish black;

+ NaOH conc. — bordeaux

35450 Direct Dye**Pluto Black G (By)**

FIAT 764 — Plutoschwarz G ex.

5-Amino-2-(*p*-aminoanilino)benzenesulfonic acid \Rightarrow (alk.) Gamma acid (2 mol.) \Rightarrow Toluene-2,4-diamine (2 mol.)**35460 C.I. Direct Blue 176 (Greenish blue)**5-Amino-2-(*p*-aminoanilino)benzenesulfonic acid \Rightarrow 1,6(and 1,7)-Cleve's acid (2 mol.) \Rightarrow (alk.) H acid (2 mol.)

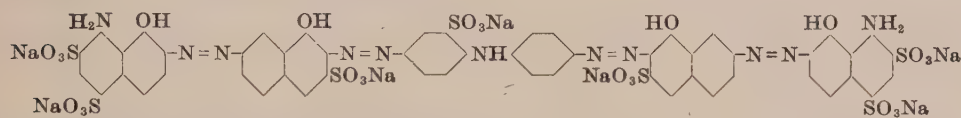
Soluble in water (greenish blue)

Slightly soluble in ethanol and Cellosolve

Insoluble in other organic solvents

 H_2SO_4 conc. — dull greenish blue; on dilution — reddish navy

Aqueous solution + NaOH 10% — pale dull reddish blue

35465 C.I. Direct Blue 175 (Navy)5-Amino-2-(*p*-aminoanilino)benzenesulfonic acid \Rightarrow (alk.) Gamma acid (2 mol.) \Rightarrow Chicago acid (2 mol.)

Soluble in water (dull reddish blue)

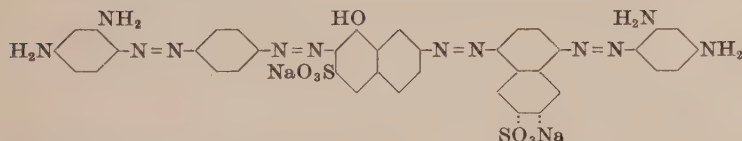
Insoluble in organic solvents

 H_2SO_4 conc. — bluish grey; on dilution — dull bluish violet solution and ppt. H_2SO_4 10% — pale dull blue

Aqueous solution + NaOH 10% — pale dull blue

Dyes of General Formula: $E \leftarrow D \rightarrow M \rightarrow M' \rightarrow E'$ **35500 Direct Dye****Oxydiamine Black A (C)**

FIAT 764 — Oxydiaminschwarz A "F"

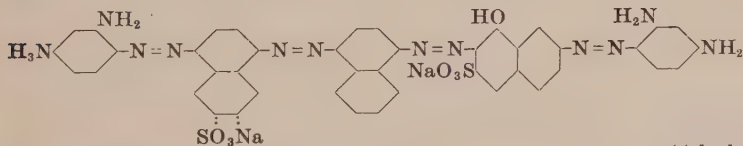


p-Aminoacetanilide $\xrightarrow{(3) \text{ hydrolyse amide group } \rightarrow}$
 $\xrightarrow{(1) \text{ (alk.) Gamma acid } \rightarrow}$ (2) 1,6(and 1,7)-Cleve's acid \rightarrow

(4) [*m*-Phenylenediamine]
 (2 mol.)

35510 Direct Dye**Diamine Grey G (C)**

FIAT 764 — Diamingrau G "F"



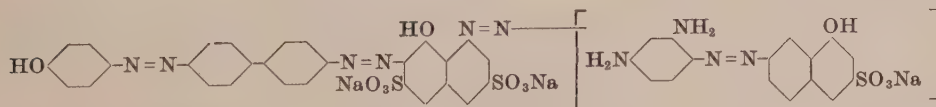
5(and 8)-Acetamido-8(and 5)-amino-2-naphthalenesulfonic acid $\xrightarrow{(3) \text{ hydrolyse amide group } \rightarrow}$
 $\xrightarrow{(1) \text{ 1-Naphthylamine } \rightarrow}$ (2) (alk.) Gamma acid \rightarrow

(4) [*m*-Phenylenediamine]
 (2 mol.)

35520 C.I. Direct Brown 33 (Dull reddish brown)

Discoverer — Cassella Co. 1891

FIAT 764 — Diaminkatechin B



Benzidine $\xrightarrow{(2) \text{ Phenol } \rightarrow}$
 $\xrightarrow{(1) \text{ (alk.) H acid } \rightarrow}$ (3) (Gamma acid \rightarrow *m*-Phenylenediamine)

Soluble in water (somewhat turbid violet brown)

Very slightly soluble in ethanol and acetone

Insoluble in other organic solvents

 H_2SO_4 conc. — bluish violet to reddish navy blue; on dilution — violet brown HNO_3 conc. — solution incomplete (reddish grey)

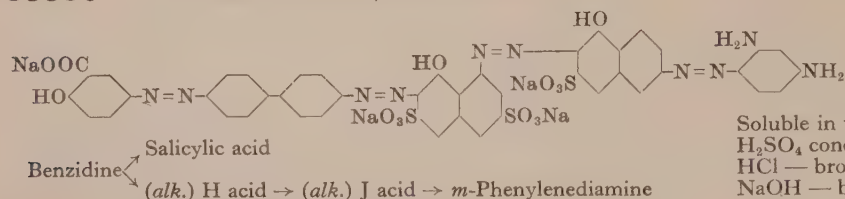
HCl conc. — solution incomplete (reddish grey)

Aqueous solution + HCl conc. — brown ppt;

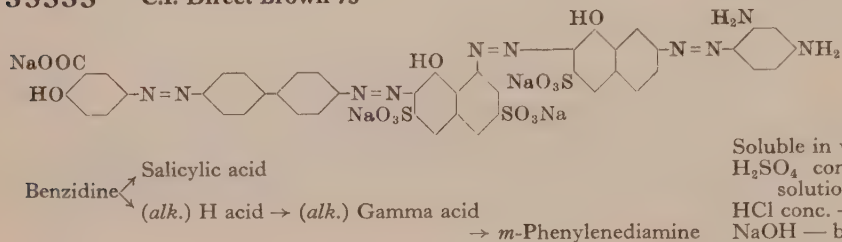
+ HCl dil. — orange brown;

+ NaOH 10% — yellowish brown

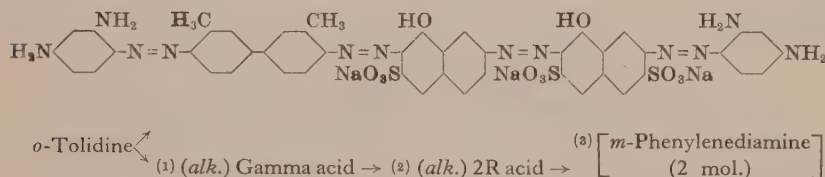
35530 C.I. Direct Brown 70 (Dull reddish brown)



35535 C.I. Direct Brown 73



35540 Direct Dye

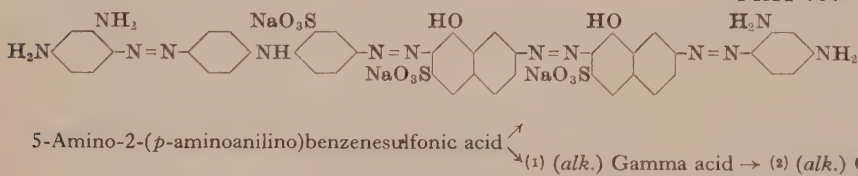


Oxydiamine Black T (C)

Cassella Co., BP 9529/94; 25018/94; USP 560448-9;
 FP 238621; GP 86110, 95415, (Fr. 4, 878, 882)
 FIAT 764 — Oxydiaminschwarz T

Soluble in water (violet grey black)
 Insoluble in ethanol
 H_2SO_4 conc. — dark blue; on dilution — violet grey
 Aqueous solution + HCl conc. — violet black ppt;
 + NaOH conc. — corinth ppt.

35545 Direct Dye



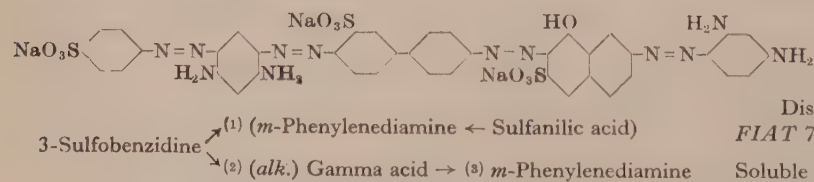
Diamine Deep Black CR, RB (C)

FIAT 764 — Diamintiefschwarz CR "F", RB

In Diamine Deep Black RB the first coupling to be carried out was
 Gamma acid \rightarrow (alk.) Gamma acid

Dyes of General Formula: A \rightarrow Z \leftarrow D \rightarrow M \rightarrow E

35600 Direct Dye



Discoverer — M.L.B. 1896

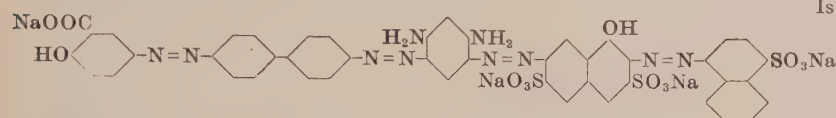
Dianil Brown BD (MLB)

Fastness Properties (C), coupled with diazotised
p-nitroaniline: Acid (organic) 5, Alkali 4,
 Light 1, 2, 3, Washing 2-3, Water 3
 Dischargeability: neutral, good; alkaline, fairly good
 FIAT 764 — Dianilbraun BD

Soluble in water (deep brown)
 Moderately soluble in ethanol (pale brown)
 H_2SO_4 conc. — violet grey black; on dilution — brown
 Aqueous solution + HCl conc. — brown ppt;
 + NaOH conc. — orange brown

Dyes of General Formula: A → M → Z ← D → E

35650 Direct Dye



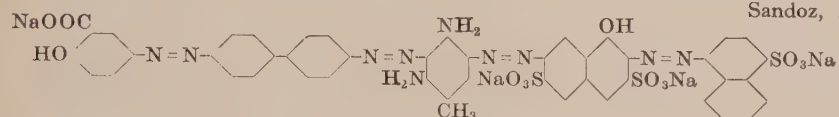
Benzidine → (1) Salicylic acid
 (2) (*m*-Phenylenediamine (acid) ← 2R acid)
 (3) ← Naphthionic acid

Naphthamine Fast Brown NZ (K)

Is very similar in properties to the dyes recorded under C.I. 35660

FIAT 764 — Naphtaminechtbraun NZ
 (See latest process recorded in PB 74025, fr. 1468)

35660 C.I. Direct Brown 31 (Reddish brown)



Benzidine → (1) Salicylic acid
 (2) (Toluene-2,4-diamine (acid) ← O-Phenylsulfonyl 2R acid);
 then hydrolyse the benzenesulfonyl ester group
 (3) ← Naphthionic acid

(In some brands 2R acid is used instead of its O-phenylsulfonyl derivative as in C.I. 35650)

Discoverer — M. Böniger 1897

Sandoz, BP 5746/98; USP 608024; FP 275733; GP 114638 (Fr. 6, 1025)

FIAT 764 — Naphtaminechtbraun ARD "F"
 PB 74741, fr. 8423 — Manufacture from 2R acid directly

Soluble in water (yellowish brown)
 Moderately soluble in ethanol and Cellosolve
 Insoluble in other organic solvents

Typical reactions —

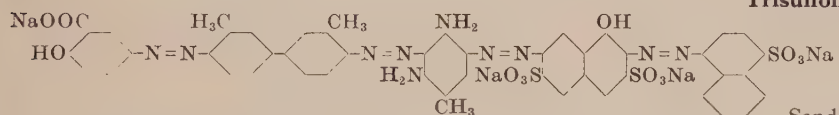
H₂SO₄ conc. — bluish violet or brown and violet black; on dilution — yellowish to reddish brown ppt.

HNO₃ conc. — brown

NaOH 10% — bluish red

Aqueous solution + HCl conc. — reddish orange brown;
 + NaOH conc. — orange brown ppt.

35670 Direct Dye



o-Tolidine → (2) Salicylic acid
 (3) (Toluene-2,4-diamine ← 2R acid)
 (1) ← Naphthionic acid

Discoverer — M. Böniger 1897

Trisulfon Brown G (S)

Fastness Properties (C): Acid (organic) and Alkali, good; Light and Washing, moderate. The fastness to light and washing is improved by after-treatment with dichromate or copper sulfate

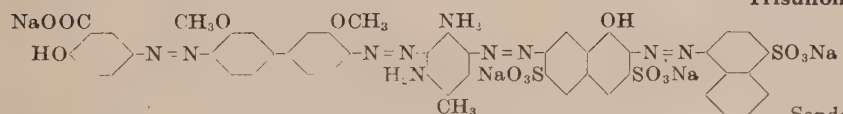
Sandoz, BP 5746/98; USP 608024; FP 275733; GP 114638 (Fr. 6, 1025)

Soluble in water (coffee brown)

H₂SO₄ conc. — bluish violet; on dilution — dark brown ppt.

Aqueous solution + HCl — blackish brown ppt;
 + NaOH — reddish brown

35680 Direct Dye



o-Dianisidine → (2) Salicylic acid
 (3) (Toluene-2,4-diamine ← 2R acid)
 (1) ← Naphthionic acid

Discoverer — M. Böniger 1897

Trisulfon Brown 2G (S)

Fastness Properties (C): Acid (organic) and Alkali, good; Light and Washing, moderate. The fastness to light and washing is improved by after-treatment with dichromate or copper sulfate

Sandoz, BP 5746/98; USP 608024; FP 275733; GP 114638 (Fr. 6, 1025)

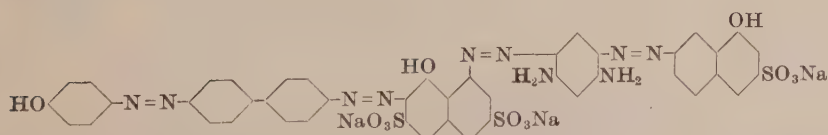
Soluble in water (brown)

H₂SO₄ conc. — bluish violet; on dilution — dark brown ppt.

Aqueous solution + HCl — black brown;
 + NaOH — reddish brown

Dyes of General Formula: E ← D → M → Z ← A

35700 C.I. Direct Brown 43 (Dull reddish brown)



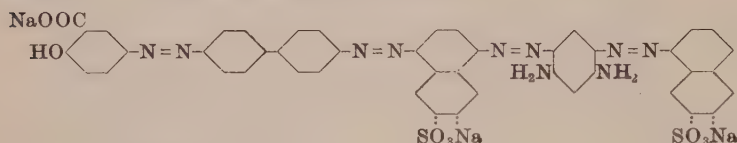
Benzidine → (2) Phenol
 (1) (alk.) H acid → (3) (*m*-Phenylenediamine ← Gamma acid)

Soluble in water (dark brown)

H₂SO₄ conc. — violet; on dilution — brown

Aqueous solution + HCl conc. — dark ppt;
 + NaOH conc. — brown

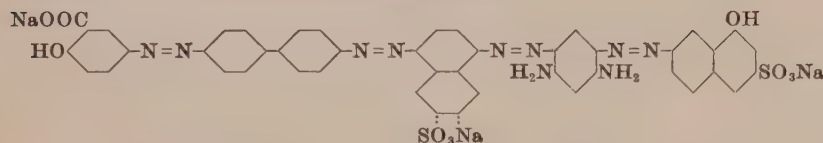
35710 C.I. Direct Brown 13 (Brown)



Benzidine \leftarrow Salicylic acid
 \leftarrow 1,6(and 1,7)-Cleve's acid \rightarrow *m*-Phenylenediamine
 \leftarrow 1,6(and 1,7)-Cleve's acid

Soluble in water (brownish red) and ethanol
 H_2SO_4 conc. — violet; HCl conc. — reddish orange solution

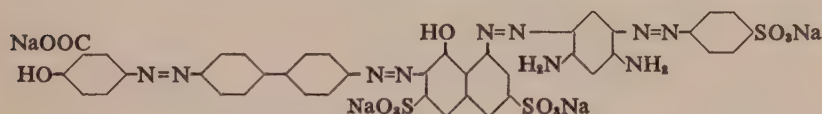
35715 C.I. Direct Brown 14 (Brownish olive)



Benzidine \leftarrow Salicylic acid
 \leftarrow 1,6(and 1,7)-Cleve's acid \rightarrow *m*-Phenylenediamine
 \leftarrow Gamma acid

Soluble in water
 Insoluble in ethanol
 H_2SO_4 conc. — violet; HCl conc. — red brown solution

35720 C.I. Direct Brown 215 (Dull brown)

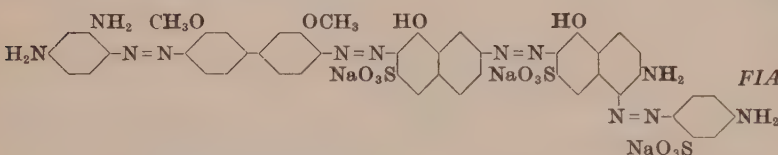


Benzidine \leftarrow Salicylic acid
 (alk) \leftarrow H acid \rightarrow *m*-Phenylenediamine \leftarrow Sulfanilic acid

35730 Direct Dye

Discoverer — Oehler

Columbia Black TB (A)



Fastness Properties (C): Acid (organic) 2-3, Alkali 5,
 Light 3, Washing 2, Water 2
 Dischargeability: neutral, good; alkaline, fairly good

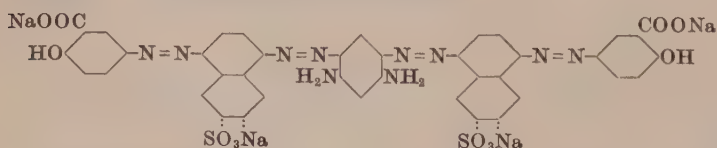
FIAT 764 — Columbiaschwarz TB

Soluble in water (dull violet)
 Very slightly soluble in ethanol
 H_2SO_4 conc. — dull bluish green + bluish black + magenta
 (blue black); on dilution — corinth
 Aqueous solution + HCl conc. — dull violet ppt;
 + NaOH conc. — corinth ppt.

o-Dianisidine \leftarrow (1) *m*-Phenylenediamine
 (1) (alk.) Gamma acid \rightarrow (2) (alk.) (J acid
 (acid) \leftarrow 2-Amino-5-nitrobenzenesulfonic acid);
 and finally reduce the nitro group

Dyes of General Formula: $\text{A} \rightarrow \text{M} \rightarrow \text{Z} \leftarrow \text{M}' \leftarrow \text{A}'$

35750 C.I. Mordant Brown 36 (Brown)



(5-Aminosalicylic acid \rightarrow 1,6(and 1,7)-Cleve's acid) (2 mol.)
 \rightarrow *m*-Phenylenediamine

Cassella Co., BP 2446/96; FP 253834; GP 92655 (Fr. 4, 791)

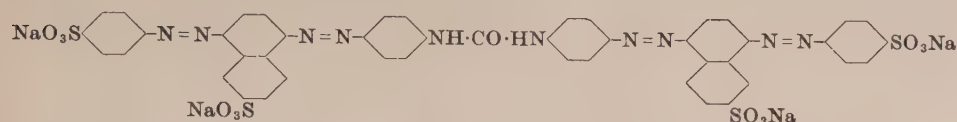
Cassella Co., JSDC, 13 (1897), 171

FDX 885 — Anthracensaeurebraun B

Soluble in water
 Insoluble in ethanol
 H_2SO_4 conc. — dark blue; on dilution — blue ppt.
 Aqueous solution + HCl conc. — blue ppt;
 + NaOH conc. — ppt.

35760 C.I. Direct Red 84 (Dull yellowish red)

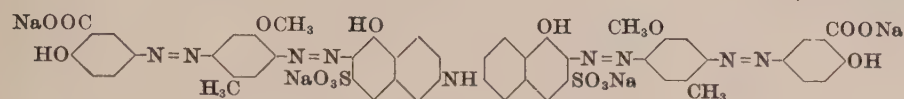
FIAT 764 — Siriuslichtbraun 3RL



Sulfanilic acid → 1,6-Cleve's acid → Anilinomethanesulfonic acid;
hydrolyse to remove the methanesulfonic acid group, then phosgenate

35770 C.I. Direct Blue 162 (Dull blue)*

Ciba, Sw.P 187024



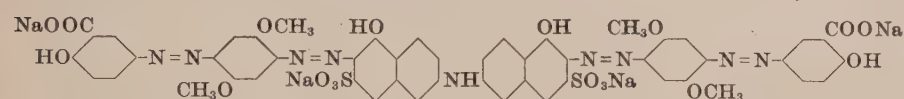
Frahm, *Chem. Weekbl.* **48** (1952), 130 —
Coprantine Blue RRL

(5-Aminosalicylic acid → Cresidine) (2 mol.)
⇒ 6,6'-Iminobis-1-naphthol-3-sulfonic acid

* Aftertreated with copper salts

35775 C.I. Direct Blue 159 (Dull blue)*

Ciba, Sw.P 187024



Frahm, *Chem. Weekbl.* **48** (1952), 130 —
Coprantine Blue GGL

(5-Aminosalicylic acid → 2,5-Dimethoxyaniline) (2 mol.)
⇒ 6,6'-Iminobis-1-naphthol-3-sulfonic acid

* Aftertreated with copper salts

35780 C.I. Direct Red 80 (Bright bluish pink

→ Bright bluish red)

Discoverer — J. P. Penny 1922

National Aniline, USP 1509442

FIAT 764 — Siriusrot F3B



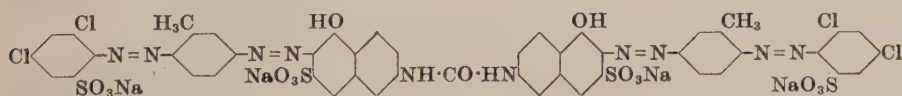
(a) 6-Amino-3,4'-azodibenzenesulfonic acid → *N*-Acetyl J acid;
then hydrolyse the acetamido group and phosgenate, or

(b) 6-Amino-3,4'-azodibenzenesulfonic acid (2 mol.)
⇒ 6,6'-Ureylenebis-1-naphthol-3-sulfonic acid

Soluble in water (bluish red to magenta)
Very slightly soluble in ethanol and Cellosolve
Insoluble in other organic solvents
H₂SO₄ conc. — blue; on dilution — bluish red to violet
HNO₃ conc. — blue
Aqueous solution + HCl conc. — violet ppt;
+ NaOH conc. — reddish violet

35785 C.I. Direct Red 194

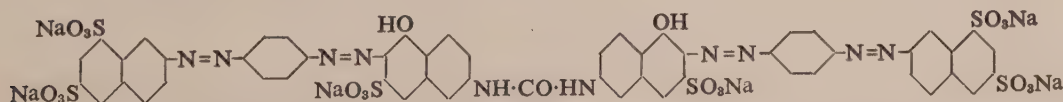
Discoverers — J. Hilger and C. Taube 1932



[2-Amino-3,5-dichlorobenzenesulfonic acid
→ *m*-Toluidinomethanesulfonic acid;
hydrolyse to remove the methanesulfonic acid group] (2 mol.)
⇒ 6,6'-Ureylenebis-1-naphthol-3-sulfonic acid

I.G., BP 427973; USP 2026920; FP 762830; GP 614541 (*Fr.* **22**,
1003)
FIAT 764 — Siriusrot 6B

Soluble in water (bluish red)
Slightly soluble in ethanol
H₂SO₄ conc. — blue; on dilution — reddish violet
Aqueous solution + HCl conc. — dullish violet, ppt;
+ NaOH conc. — bordeaux, ppt.

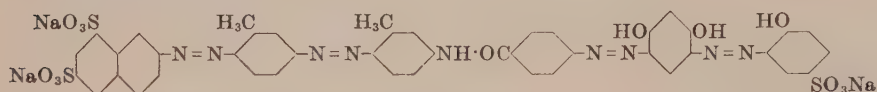
35790 C.I. Direct Red 32 (Bluish red)

7-Amino-1,3-naphthalenedisulfonic acid → Anilinomethanesulfonic acid [hydrolyse to remove the methanesulfonic acid group] (2 mol.) ⇒ 6,6'-Ureylenebis-1-naphthol-3-sulfonic acid

Dyes of General Formula: $A \rightarrow M \rightarrow M' \rightarrow Z \leftarrow A'$

35800 C.I. Direct Brown 100 (Yellowish brown)

Copper complex derived from



2-Amino-1-phenol-4-sulfonic acid \rightarrow Resorcinol;
then treat with aqueous copper sulfate at 30°C and use the resulting copper complex as E in

7-Amino-1,3-naphthalenedisulfonic acid \rightarrow *m*-Toluidine \rightarrow *m*-Toluidine;
condense with *p*-nitrobenzoyl chloride and reduce the nitro group, then \rightarrow E

Discoverers — D. Delfs and R. Knocke 1935

I.G., BP 462675; USP 2127678; FP 810089; GP 658017 (Fr. 24, 686)

FIAT 764 — Siriuslichtbraun 5G

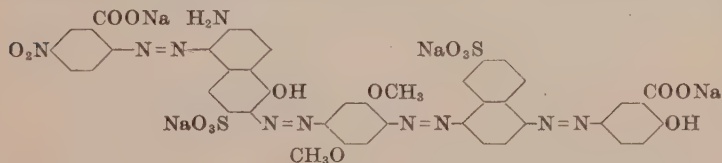
Soluble in water (orange brown)

Very slightly soluble in ethanol

H₂SO₄ conc. — reddish brown + violet; on dilution — yellowish brown

Aqueous solution + HCl conc. — olive brown, ppt;
+ NaOH conc. — orange brown ppt.

35810 C.I. Direct Black 97 (Bluish grey)*



5-Nitroanthranilic acid (acid) \rightarrow J acid

5-Aminosalicylic acid \rightarrow 1,7-Cleve's acid \rightarrow 2,5-Dimethoxyaniline \rightarrow J acid

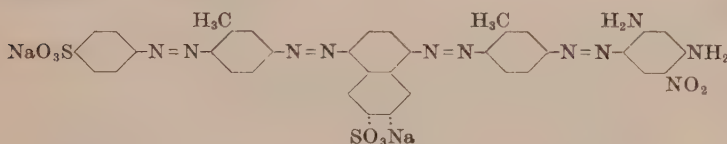
* Aftertreated with copper salts

Discoverer — W. Bossard 1944

Geigy Co., BP 589536; USP 2459913; FP 940594; Sw.P 244518
Frahm, Chem. Weekbl. 48 (1952), 130

Dyes of General Formula: $A \rightarrow M \rightarrow M^1 \rightarrow M^2 \rightarrow E$

35850 Direct Dye



Sulfanilic acid \rightarrow *m*-Toluidine \rightarrow 1,6 (and 1,7)-Cleve's acid
 \rightarrow *m*-Toluidine \rightarrow 4-Nitro-*m*-phenylenediamine

Discoverers — W. Lange and L. Neumann 1921

Solamine Brown 4RL (A)

Fastness Properties (C): Acid (organic) 2-3, Alkali 3,
Light 4, 4-5, 5, Washing 2, Water 2

Agfa, BP 208265; USP 1504125; FP 556489; GP 397699 (Fr. 14, 996)

FIAT 764 — Solaminbraun 4RL

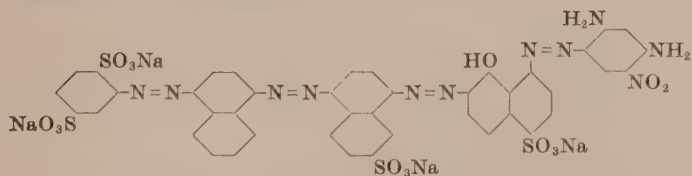
Soluble in water (yellowish brown)

Slightly soluble in ethanol (reddish brown)

H₂SO₄ conc. — bluish green; on dilution — corinth

Aqueous solution + HCl conc. — brown ppt;
+ NaOH conc. — yellowish brown

35860 C.I. Direct Black 77 (Greenish grey)



2-Amino-*p*-benzenedisulfonic acid \rightarrow 1-Naphthylamine
 \rightarrow 1,7-Cleve's acid \rightarrow (alk.) S acid \rightarrow 4-Nitro-*m*-phenylenediamine

Discoverers — W. Lange and L. Neumann 1921

Agfa, BP 208265; USP 1496780; FP 556489; GP 404355 (Fr. 14, 997)

FIAT 764 — Siriuslichtgrau GG

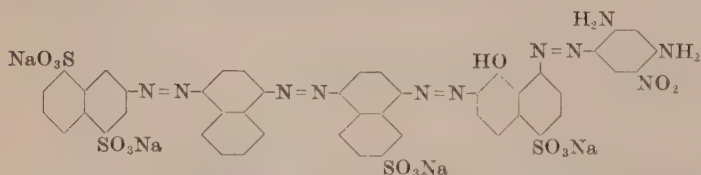
Soluble in water (greyish black)

Very slightly soluble in ethanol

H₂SO₄ conc. — greyish black; on dilution — violet grey brown

Aqueous solution + HCl conc. — violet black ppt;
+ NaOH conc. — greyish black ppt.

35865 C.I. Direct Black 76 (Brownish grey)



3-Amino-1,5-naphthalenedisulfonic acid \rightarrow 1-Naphthylamine
 \rightarrow 1,7-Cleve's acid \rightarrow (alk.) S acid \rightarrow 4-Nitro-*m*-phenylenediamine

Discoverers — W. Lange and L. Neumann 1921

Agfa, BP 208265; USP 1496780; FP 556489; GP 404355 (Fr. 14, 997)

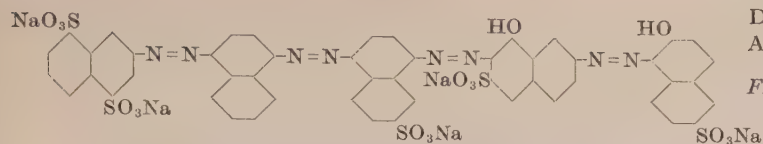
FIAT 764 — Siriusgrau GB

Soluble in water (violet grey to violet black)

Very slightly soluble in ethanol

H₂SO₄ conc. — grey and bluish grey; on dilution — greyish violet

Aqueous solution + HCl conc. — violet grey to violet black, ppt;
+ NaOH conc. — violet grey to violet black, ppt.

35870 C.I. Direct Black 75 (Bluish grey)

3-Amino-1,5-naphthalenedisulfonic acid → 1-Naphthylamine
 → 1,7-Cleve's acid → (alk.) Gamma acid → Schaeffer's acid

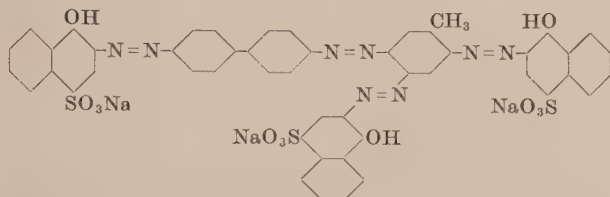
Discoverers — W. Lange and L. Neumann 1925

Dyes of similar constitution —

Agfa, BP 208265; USP 1496780; FP 556489; GP 397699, 404355
 (Fr. 14, 996, 997)

FIAT 764 — Siriuslichtgrau R

Soluble in water (dark blue)
 Very slightly soluble in ethanol
 H₂SO₄ conc. — violet black; on dilution — dull violet
 Aqueous solution + HCl conc. — violet black ppt;
 + NaOH conc. — dark blue ppt.

Tetrakisazo Dyes of Other General Formulae**35900 Direct Dye**

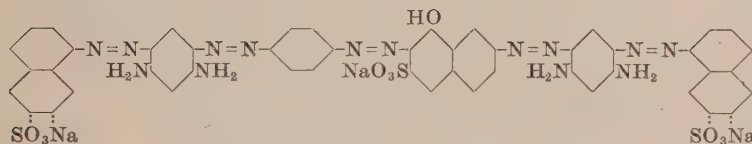
Discoverer — Markfeldt 1895

Direct Heliotrope B (R)

Remy, GP 99126 (Fr. 5, 594)

Benzidine → (1) Nevile and Winther's acid
 → (2) 3-Amino-4-methyloxanilic acid
 → (3) Nevile and Winther's acid;
 (4) hydrolyse the oxamic acid group, then → (5) Nevile and Winther's acid

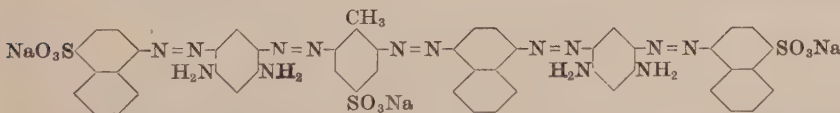
Soluble in water (violet)
 Slightly soluble in ethanol
 H₂SO₄ conc. — blue; on dilution — reddish violet ppt;
 Aqueous solution + HCl — reddish violet ppt;
 + NaOH — bluer

Polyazo Dyes with Five or More Azo Groups**36000 Direct Dye**

Oxydiamine Black UI (C)

FIAT 764 — Oxydiaminschwarz UI ex. kz.

[p-Aminoacetanilide → (1) (alk.) Gamma acid
 → (2) hydrolyse amide group] → (3) m-Phenylenediamine (2 mol.) (4) ← 1,6(and 1,7)-Cleve's acid (2 mol.)

36010 Direct Dye

Discoverer — Oehler

New Toluylene Brown ORR (By)

[3,5-Diamino-p-toluenesulfonic acid → (1) 1-Naphthylamine] → (2) m-Phenylenediamine (2 mol.) ← Naphthionic acid (2 mol.)

36020 C.I. Acid Brown 92 (Dark brown)*

Mixture of polyazo dyes obtained as follows

[65% p-Nitroaniline] → (1) (acid) [60% H acid] (alk.) (2) ← Sulfanilic acid
 [35% m-Nitroaniline] → [40% J acid]

(3) reduce nitro groups → [25% 6-Amino-3,4'-azodibenzenesulfonic acid
 (4) Resorcinol → [75% 2-Amino-5-nitrobenzenesulfonic acid
 (5) p-Nitroaniline
 (6) p-Nitroaniline

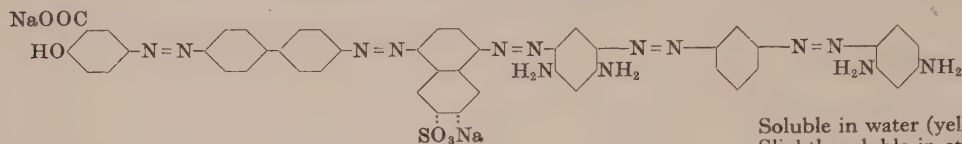
Discoverer — F. Schubert 1935

I.G., BP 456768; USP 2106876; FP 804351; GP 711386
 (Fr.-Bayer, I-1, 483)

FIAT 764 — Igenaldunkelbraun C

Moderately soluble in water (brown)
 Insoluble in ethanol
 H₂SO₄ conc. — grey black; on dilution — olive brown
 Aqueous solution + HCl conc. — olive brown;
 + NaOH conc. — blue black

* On leather

36030 C.I. Direct Brown 25 (Brown → Reddish brown)

Cassella Co., BP 2789/92; FP 219567;
GP *ap.* C3949 (Fr. 3, 685), GP
128049 (Fr. 6, 992)
FIAT 764 — Benzobraun BH. Dia-
minkatechin G

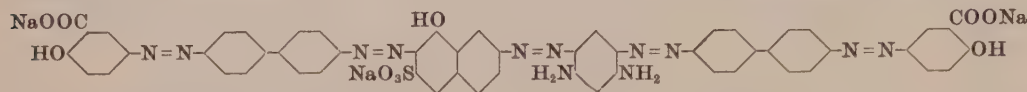
Benzidine $\begin{cases} \nearrow (1) \text{ Salicylic acid} \\ \searrow (2) \text{ 1,6 (and 1,7)-Cleve's acid} \end{cases} \rightarrow (3) \text{ Bismarck Brown (C.I. 21000)}$

Soluble in water (yellowish to olive brown)
Slightly soluble in ethanol, acetone and Cellosolve
Insoluble in other organic solvents
 H_2SO_4 conc. — violet to blue black; on dilution — pale brown
 HNO_3 conc. — solution incomplete (olive)
Aqueous solution + HCl conc. — olive brown ppt;
+ NaOH conc. — yellowish to orange brown ppt.

Note — Coupling (3) may occur in position 2 of the *m*-phenylenediamine residue; see Fierz and Blangey, 287

36040 Direct Dye

Discoverer — M.L.B.



$\left[\text{Benzidine} \begin{cases} \nearrow (1) \text{ Salicylic acid} \\ \searrow \end{cases} \right] (2 \text{ mol.}) \rightleftharpoons (\text{Gamma acid} \rightarrow m\text{-Phenylenediamine})$

Dianil Fast Brown B (MLB)

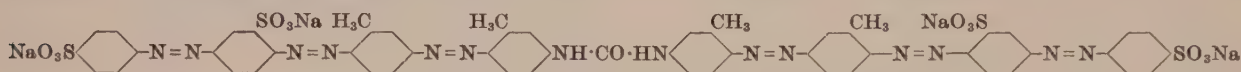
Fastness Properties (C): Acid (organic) 1, Alkali 4,
Light 2, Washing 2-3, Water 3

Dyes of similar constitution —

Durand & Huguenin, FP 268561; GP *ap.* D8352 (Fr. 5, 594)
FIAT 764 — Dianilechtbraun B

36200 C.I. Direct Brown 106 (Dull orange → Brown)

Discoverers — O. Günther, L. Hesse, and A. Zart 1909



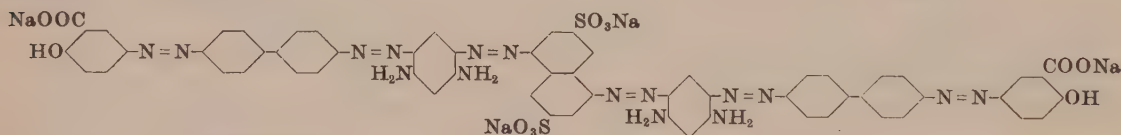
6-Amino-3,4'-azodibenzenesulfonic acid
→ *m*-Toluidine → *m*-Toluidine;
then phosgenate

Bayer Co., BP 13727/09; USP 978580; FP 402030; GP 223753
(Fr. 10, 866)
FIAT 764 — Siriuslichtbraun G

Soluble in water and ethanol (orange brown)
 H_2SO_4 conc. — dullish blue (+ pale reddish violet); on dilution
— brown
Aqueous solution + HCl conc. — brown ppt;
+ NaOH conc. — orange brown ppt.

36210 Direct Dye

Discoverer — Cassella Co.



$\left[\text{Benzidine} \begin{cases} \nearrow (1) \text{ Salicylic acid} \\ \searrow \end{cases} \right] (2 \text{ mol.}) \rightleftharpoons (2) [m\text{-Phenylenediamine (2 mol.)} \rightleftharpoons 4,8\text{-Diamino-2,6-naphthalenedisulfonic acid}]$

Oxydiamine Brown RN (C)

Fastness Properties (C): Acid (organic) 2, Alkali 3,
Light 2, Washing 2, Water 2

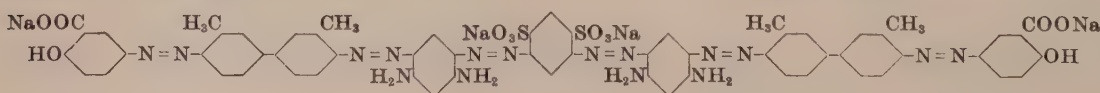
Dischargeability: neutral, fairly good; alkaline, fair
May be coupled with diazotised *p*-nitroaniline or after-
treated with dichromate and copper sulfate

FIAT 764 — Oxydiaminbraun RN

Soluble in water (yellowish brown) and ethanol (brownish yellow)
 H_2SO_4 conc. — violet black (violet + blue + magenta red); on
dilution — olive brown
Aqueous solution + HCl conc. — brown ppt;
+ NaOH conc. — orange brown ppt.

36220 Direct Dye

Discoverer — Agfa



$\left[o\text{-Toluidine} \begin{cases} \nearrow (1) \text{ Salicylic acid} \\ \searrow \end{cases} \right] (2 \text{ mol.}) \rightleftharpoons (2) [m\text{-Phenylenediamine (2 mol.)} \rightleftharpoons 4,6\text{-Diamino-}m\text{-benzenedisulfonic acid}]$

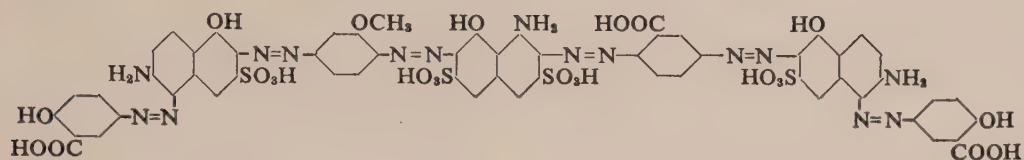
Soluble in water (yellowish brown)
Very slightly soluble in ethanol
 H_2SO_4 conc. — violet black; on dilution — pale olive yellow
Aqueous solution + HCl conc. — brown ppt;
+ NaOH conc. — yellowish orange brown ppt.

Columbia Catechine O (A)

Fastness Properties (C): Acid (organic) 3, Alkali 5,
Light 1, 2, 3, Washing 2, Water 2-3

FIAT 764 — Columbiakatechin O

36250 C.I. Direct Black 122 (Bluish grey)

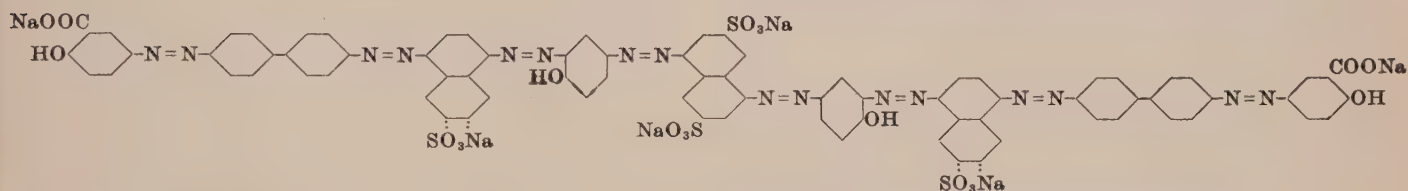


4-Nitro-*o*-anisidine (alk) → H acid (acid) → 5-Nitroanthranilic acid
(reduce the nitro groups) → (2 mol.) [5-Aminosalicilic acid → (acid) J acid]

Panchartek, Allan and Mužík, *Coll. Czech. Chem. Commun.*,
25 (1960) 2783
Swiss Pat. 248,692 (1948)

36300 C.I. Direct Brown 74 (Brown)

Discoverer — Cassella Co. 1892
FIAT 764 — Diaminkatechin 3G



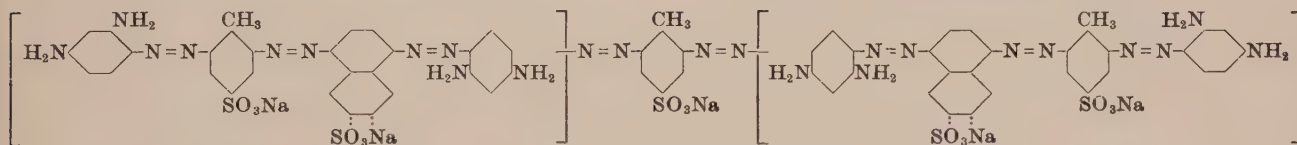
[Benzidine $\xrightarrow{(1)}$ Salicylic acid
 $\xrightarrow{(2)}$ 1,6(and 1,7)-Cleve's acid] (2 mol.) \rightleftharpoons (3) [Phenol (2 mol.) \rightleftharpoons 4,8-Diamino-2,6-naphthalenedisulfonic acid]

Soluble in water (brown)
Moderately soluble in ethanol
Slightly soluble in Cellosolve
Insoluble in other organic solvents
H₂SO₄ conc. — reddish violet to violet; on dilution — olive to dark brown

HNO₃ conc. — dull red solution, turns yellow brown
Aqueous solution + HCl conc. — brownish yellow to olive ppt;
+ NaOH conc. — orange brown

36310 C.I. Direct Brown 149 (Dull reddish brown)*

Discoverer — Cassella Co.
FIAT 764 — Diaminnitrazolbraun BD



([3,5-Diamino-*p*-toluenesulfonic acid $\xrightarrow{(1)}$ 1,6(and 1,7)-Cleve's acid] (2 mol.) \rightleftharpoons (2) *m*-Phenylenediamine (4 mol.) \rightleftharpoons (3) 3,5-Diamino-*p*-toluenesulfonic acid)

Moderately soluble in water (brown)
Slightly soluble in ethanol
H₂SO₄ conc. — olive; on dilution — yellowish brown
Aqueous solution + HCl conc. — dark brown ppt;
+ NaOH conc. — dark orange brown

* Coupled with diazotised *p*-nitroaniline

36311 C.I. Direct Brown 150 (Reddish brown)*

Polyazo dye of indeterminate constitution obtained by tetrazotising
3,5-diamino-*p*-toluenesulfonic acid (2 mol.) and coupling with 1,6(and
1,7)-Cleve's acid (1 mol.) and *m*-phenylenediamine (1 mol.)
(Related to C.I.36310)

* Coupled with diazotised *p*-nitroaniline

Discoverer — C. Rudolph 1889

Dye of indeterminate constitution comprising a mixture of azo dyes of varying complexity. Nominally it is the dye of structure

Toluylene Brown T (By)

Oehler, *BP* 11000/89; *USP* 465116; *FP* 199658; *GP* 58657
(*Fr.* 3, 738)

FIAT 764 — Toluylenbraun T



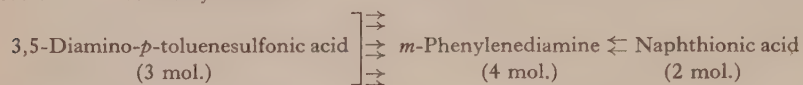
in which A = Naphthionic acid, D = 3,5-Diamino-*p*-toluenesulfonic acid and Z = *m*-Phenylenediamine

Very soluble in water (orange brown)

Slightly soluble in ethanol

H₂SO₄ conc. — dark reddish brown; on dilution — yellowish brown

Aqueous solution + HCl conc. — brown ppt;
+ NaOH conc. — orange brown



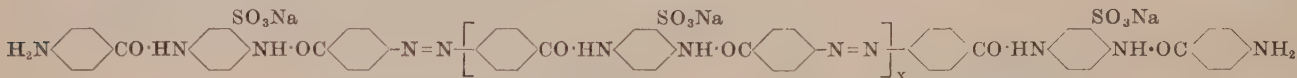
36350 C.I. Direct Yellow 60 (*Bright yellow*)*

Discoverer — W. Lange 1928

Mixture of polyazo dyes of varying complexity conforming approximately to the formula

I.G., GP 565478 (*Fr.* 19, 1766)

FIAT 764 — Diazolichtgelb 3GL



Treat 2,5-bis(*p*-nitrobenzamido)benzenesulfonic acid with sodium sulfide at room temperature

Soluble in water (greenish yellow)

Slightly soluble in ethanol

H₂SO₄ conc. — greenish yellow; on dilution — very pale yellow

Aqueous solution + HCl conc. — pale greenish yellow ppt;

+ NaOH 10% — no change;

+ NaOH conc. — pale yellow ppt.

* Developed with methylphenylpyrazolone

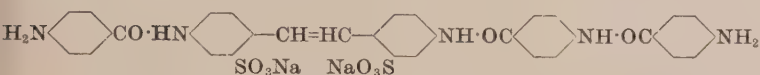
NOTES

Dyes devoid of azo chromophoric groups but used for the production of azo dyes on the fibre

The very small number of compounds forming this group are Direct dyes which differ from the many other diazotised and developed dyes listed in previous azo groups in that they are themselves colourless or at most faintly yellow in hue; on diazotising and developing on the fibre with methylphenylpyrazolone they give greenish yellow hues.

Except for the absence of azo groups these compounds have patterns of chemical structure typical of direct dyes, and they have similar application properties to direct dyes. In this respect they differ from the azoic products although broadly they form a link between the latter and the typical water-soluble pre-formed azo dyes.

36900 C.I. Direct Yellow 62 (Bright yellow)*



Discoverer — G. Holste 1910

Bayer Co., GP 250342 (Fr. 10, 1329), GP 252376 (Fr. 11, 158)

FIAT 764 — Diazolichtgelb GG

Treat 4,4'-dinitro-2,2'-stilbenedisulfonic acid with sodium sulfide so as to reduce one nitro group to an amino group. Condense with *p*-nitrobenzoyl chloride and reduce to amino groups both the nitro group so introduced and the remaining nitro group attached to the stilbene residue. Condense with two molecules of *p*-nitro benzoyl chloride and reduce both the nitro groups so introduced

* Developed with methylphenylpyrazolone

Moderately soluble in water (very pale brownish yellow)

Slightly soluble in Cellosolve

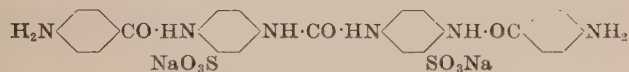
Insoluble in other organic solvents

H₂SO₄ conc. — very pale olive; on dilution — very pale yellow

HNO₃ conc. — pale olive solution

Aqueous solution + HCl conc. — very pale brownish yellow;
+ NaOH conc. — pale olive yellow

36910★ Direct Dye



Condense 5,5'-ureylenebis(2-aminobenzenesulfonic acid) with *p*-nitrobenzoyl chloride (2 mol.); then reduce both nitro groups to amino groups

Discoverer — G. Holste 1910

Bayer Co., GP 250342 (Fr. 10, 1329)

C.I. (1st edition) No. 654 (commercial name apparently incorrect)

Soluble in water (pale bright brown)

Very slightly soluble in ethanol (very pale brown)

H₂SO₄ conc. — pale greyish brown; on dilution — very pale reddish brown

Aqueous solution + HCl conc. — pale violet grey ppt;
+ NaOH conc. — pale yellowish brown ppt.

NOTES

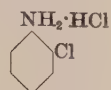
NOTES

AZOIC SECTION

The presentation of constitutional data relating to the Azoic Section of the *Colour Index* has presented the editors with some difficulty insofar as all the products mentioned in Vol. 1 under the Azoic Section are either intermediates or mixtures of intermediates and are not in themselves finished dyestuffs. It was felt that as the section headed Azoic Compositions was entirely made up of mixtures of intermediates containing a variety of stabilising and buffering agents, any constitutional information which was available should be included in Vol. 1. This has been done and in this volume constitutional information is confined purely to the Azoic Diazo Components and the Azoic Coupling Components. C.I.37000 to C.I.37275 includes constitutional data on the Diazo Components, whilst the corresponding data on the Coupling Components commences at C.I.37500 and proceeds to C.I.37625. The order has been determined by taking the normal chemical progressions — for example, in the Diazo Components Section we commence with derivatives of aniline followed by derivatives of toluidine, anisidine etc, building up to the more complicated structures in the later numbers. Similarly, in the Coupling Components Section the first number refers to the simplest product — namely, 2-naphthol — followed by the anilide of 3-hydroxy 2-naphthoic acid and other arylamides in normal chemical progression, leading up finally to the more complicated derivatives based on the acetoacetic esters with other derivatives such as benzoyl-acetic acid esters, benzocarbazoles and dibenzofurans.

Literature and patent references are given where available against each product, and whilst there are many references to the constitution of these products in the technical journals it is felt that the quoted references give sufficient information for most purposes and that there is no need to append a further list of general literature.

37000 C.I. Azoic Diazo Component 44



o-Chloroaniline hydrochloride

or free base according to type

Reduction of 1-chloro-2-nitrobenzene

Discoverers — Winther, Laska, Zitscher 1911

Fundamental Patents

BP 6379 (1912), 17279 (1913), 3313 (1914), 17272 (1914); *USP* 1034853, 1122564, 1169267, 1099108; *GP* 256999, 261594, 268542, 285664, (*Fr.* 11, 462, 466, 470; 12, 365)

Gr.-El., *GP* 386054 (*Fr.* 14, 1006)

I.G., *GP* 551880, 539116, 594326, 549983, (*Fr.* 19, 1627; 18, 949; 20, 1125; 19, 1609)

Stabilised Diazo Salt

I.G., *GP* 454894, 448728, (*Fr.* 15, 569, 577)

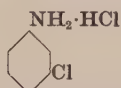
Other References

FIAT 764 — Echtgelbsalz GC

Diserens, Vol. I, Part 1, p. 422-3

Diserens (Eng. Transl. 1948), Vol. 1, p. 364-5

37005 C.I. Azoic Diazo Component 2



m-Chloroaniline hydrochloride

or free base according to type

Reduction of 1-chloro-3-nitrobenzene

Discoverers — Winther, Laska, Zitscher 1911

Fundamental Patents

See C.I.37000

Stabilised Diazo Salt

BP 269212

I.G., *GP* 499294, 478031, (*Fr.* 16, 1651, 900)

Other References

FIAT 764 — Echterangesalz GC

Beilstein, 12, p. 602

Diserens, Vol. I, Part 1, p. 422-3

Diserens (Eng. Transl. 1948), Vol. 1, p. 365-6

37010 C.I. Azoic Diazo Component 3



2,5-Dichloroaniline

Reduction of 1,4-dichloro-2-nitrobenzene

Discoverers — Winther, Laska, Zitscher 1911

Fundamental Patents

See C.I.37000

Stabilised Diazo Salt

I.G., *GP* 454894, 448728, (*Fr.* 15, 569, 577)

Other References

FIAT 764 — Echtscharlachsatz GG kz.

Beilstein, 12, p. 265

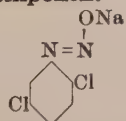
Diserens, Vol. I, Part 1, p. 426-7

Diserens (Eng. Transl. 1948), Vol. 1, p. 370-1

Rowe & Corbishley, *JSDC*, 41 (1925), 278

Rowe & Levin, *JSDC*, 41 (1925), 354

37015 Azoic Diazo Component



Sodium 2,5-dichlorobenzenediazotate

Action of alkali on a diazonium salt of 2,5-dichloroaniline

Discoverers — Laska, Zitscher 1914

Rapidogen G (GrE)

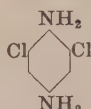
Fundamental Patents

See C.I.37000

Other References

Gr.-El., *GP* 287086, 291076, 408505, (*Fr.* 12, 364, 370; 14, 1043)

FIAT 764 — Rapidogen G Tg. dopp. kz.

37020 C.I. Azoic Diazo Component 117

Stabilised diazo salt of 2,6-dichloro-*p*-phenylenediamine

Note — Only the NH₂ group in the 4-position is diazotised

The corresponding base is not marketed

Preparation of the Base

Reduction of 2,6-dichloro-4-nitroaniline

Discoverers — Schnitzspahn, Koch 1932

Fundamental Patents

See C.I.37000

Stabilised Diazo Salt

I.G., GP 454894 (Fr. 15, 569)

Other Referentes

FIAT 764 — Echtbraunsalz RR

37025 C.I. Azoic Diazo Component 6

o-Nitroaniline

Heating 1-chloro-2-nitrobenzene with ammonia under pressure

Discoverers — Winther, Laska, Zitscher 1911

Fundamental Patents

See C.I.37000

Stabilised Diazo Salt

I.G., GP 454894, 448728, (Fr. 15, 569, 577)

Other References

Diserens, Vol. I, Part 1, p. 424–5

Diserens (Eng. Transl. 1948), Vol. 1, p. 367

FIAT 764 — Echterorange GR Base

Echterangesalz GR

37030 C.I. Azoic Diazo Component 7

m-Nitroaniline

Partial reduction of *m*-dinitrobenzene

Discoverers — Winther, Laska, Zitscher 1911

Fundamental Patents

See C.I.37000

Stabilised Diazo Salt

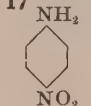
I.G., BP 269212; GP 499294 (Fr. 16, 1651)

Other References

Rowe & Levin, *JSDC*, 40, 218

FIAT 764 — Echterorange R Base

Echterangesalz R

**37035 C.I. Azoic Diazo Component 37
C.I. Developer 17**

p-Nitroaniline

(1) Action of ammonia on 1-chloro-4-nitrobenzene

(2) Nitration of acetanilide and hydrolysis (Müller)

Discoverers — Holliday & Sons 1880

Koechlin 1888

Ullrich and von Gallois 1889

Winther, Laska, Zitscher 1911

Fundamental Patents

See C.I.37000

Stabilised Diazo Salt

I.G., GP 478031, 448728, (Fr. 16, 900; 15, 577)

Other References

Diserens, Vol. I, Part 1, p. 434–5

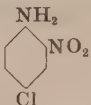
Diserens (Eng. Transl. 1948), Vol. 1, p. 379–80

Rowe & Levin, *JSDC*, 41 (1925), 354

Müller, *Chem. Ztg.* 36 (1912), 1055

FIAT 764 — Echterot GG Base

Echtrotsalz GG

37040 C.I. Azoic Diazo Component 9

4-Chloro-2-nitroaniline

Action of ammonia on 1,4-dichloro-2-nitrobenzene

Discoverers — Winther, Laska, Zitscher 1911

Fundamental Patents

See C.I.37000

Stabilised Diazo Salt

I.G., GP 454894, 448728, (Fr. 15, 569, 577)

Other References

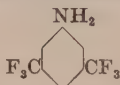
Diserens, Vol. I, Part 1, p. 432–3

Diserens (Eng. Transl. 1948), Vol. 1, p. 378

Rowe & Levin, *JSDC*, 40 (1924), 218

FIAT 764 — Echterot 3GL Base spez.

Echtrotsalz 3GL kz.

37045 C.I. Azoic Diazo Component 16

Stabilised diazo salt of 3,5-bis(trifluoromethyl)aniline

The corresponding base is not marketed

Preparation of the Base

Reduction of 1-nitro-3,5-bis(trifluoromethyl)benzene, obtained by nitration of hexafluoro-*m*-xylene

Discoverer — Müller 1932

Fundamental Patents

See C.I.37000

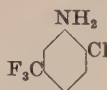
Stabilised Diazo Salt

I.G., GP 454894, 448728, (Fr. 15, 569, 577)

Other References

I.G., BP 405144; USP 1929328; GP 590255, 668033, (Fr. 20, 1099; 25, 116)

FIAT 764 — Echterangesalz GGD

37050 C.I. Azoic Diazo Component 49

Stabilised diazo salt of 4-chloro-3-amino benzotrifluoride

The corresponding base is not marketed

Preparation of the Base

Reduction of 4-chloro-3-nitro benzotrifluoride

Discoverers — Hoffa, Müller.1930

Fundamental Patents

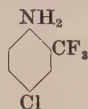
See C.I.37000

Stabilised Diazo Salt

I.G., GP 454894, 448728, 553787, (Fr. 15, 569, 577; 18, 1067)

Other References

FIAT 764 — Echterangesalz RD

37055 C.I. Azoic Diazo Component 17

Stabilised diazo salt of 4-chloro-2-trifluoromethylaniline

The corresponding base is not marketed

Preparation of the Base

Reduction of 4-chloro-1-nitro-2-trifluoromethylbenzene, obtained by nitration of 1-chloro-3-trifluoromethylbenzene

Discoverers — Hoffa, Müller 1930

Fundamental Patents

See C.I.37000

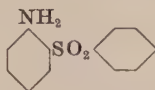
Stabilised Diazo Salt

I.G., BP 269212; GP 499294, 448728, (Fr. 16, 1651; 15, 577)

Other References

I.G., GP 637318, 551882, (Fr. 23, 190; 19, 1625)

FIAT 764 — Echtscharlachsatz VD

37060 C.I. Azoic Diazo Component 18

Stabilised diazo salt of *o*-(phenylsulfonyl)aniline

The corresponding base is not marketed

Preparation of the Base

Reduction of *o*-nitrophenyl phenyl sulfone

Discoverers — Muth, Modersohn 1932

Fundamental Patents

See C.I.37000

Stabilised Diazo Salt

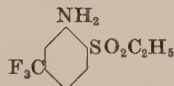
I.G., GP 454894, 448728, (Fr. 15, 569, 577)

Other References

I.G., BP 392012; GP 573046 (Fr. 19, 1638)

Ullmann & Pasdermadjian, Ber. 34 (1901), 1153

FIAT 764 — Echterangesalz LG (incorrectly indexed as Echterangesalz IG)

37065 C.I. Azoic Diazo Component 19

Stabilised diazo salt of 2-ethylsulfonyl-5-trifluoromethylaniline

The corresponding base is not marketed

Preparation of the Base

Reduction of ethyl 2-nitro-4-trifluoromethylphenyl sulfone

Discoverers — Thoma, Modersohn, Müller, Muth 1931

Fundamental Patents

I.G., GP 480814 (Fr. 16, 907)

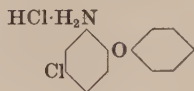
Stabilised Diazo Salt

I.G., GP 454894, 448728, (Fr. 15, 569, 577)

Other References

I.G., BP 404794; GP 588781 (Fr. 20, 1091)

FIAT 764 — Echthgoldorangesalz GR

37070 C.I. Azoic Diazo Component 26

5-Chloro-2-phenoxyaniline hydrochloride

or free base according to type

Reduction of 4-chloro-2-nitrophenyl phenyl ether obtained by condensation of 1,4-dichloro-2-nitrobenzene with sodium phenolate

Discoverers — Montmollin, Bonhôte, Spieler 1922
Laska, Zitscher 1925

Fundamental Patents

Ciba, BP 211223; USP 1453660; Sw.P 99522, 100379; GP 393701, 479713, (Fr. 14, 1028; 16, 932)

I.G., BP 235169; GP 467545, (Fr. 16, 896)

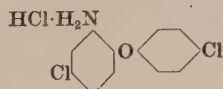
Stabilised Diazo Salt

I.G., GP 454894, 448728, (Fr. 15, 569, 577)

Other References

Semard, Teintex, 4, 76

FIAT 764 — Echtröt GF Base
Echtrötsalz FG

37075 C.I. Azoic Diazo Component 33

5-Chloro-2-(*p*-chlorophenoxy)aniline hydrochloride

or free base according to type

Reduction of 4-chloro-2-nitrophenyl *p*-chlorophenyl ether, obtained by condensation of 1,4-dichloro-2-nitrobenzene with sodium *p*-chlorophenolate

Discoverers — Montmollin, Bonhôte, Spieler 1922
Laska, Zitscher 1925

Fundamental Patents

Ciba, BP 211223; USP 1453660; Sw.P 99522, 100379; GP 393701, 479713, (Fr. 14, 1028; 16, 932)

I.G., BP 235169; GP 467545 (Fr. 16, 896)

Also see

Ciba, GP 572663 (Fr. 19, 1645)

I.G., GP 654448 (Fr. 24, 754)

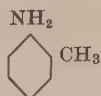
I.G., USP 2175807; FP 849724; GP 723629

Other References

Semard, Teintex, 4, 76

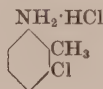
FIAT 764 — Echtröt FR Base
Echtrötsalz FR

37077 Azoic Diazo Component
C.I. Azoic Brown 29 (Component)



o-Toluidine

37080 C.I. Azoic Diazo Component 46



3-Chloro-*o*-toluidine hydrochloride
or free base according to type

Reduction of 2-chloro-6-nitrotoluene obtained as a by-product in the chlorination of *o*-nitrotoluene (see C.I.37090 method 2, BIOS 986)

Discoverers — Winther, Laska, Zitscher 1911

Fundamental Patents

See C.I.37000

Stabilised Diazo Salt

A corresponding stabilised diazo salt is not marketed

Other References

I.G., GP 434402 (*Fr.* 15, 272)

BIOS 986, 107–110

Beilstein, 12, p. 836

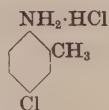
Diserens, Vol. I, Part 1, p. 430–1

Diserens (Eng. Transl. 1948), Vol. 1, p. 375

Rowe & Levin, JSDC, 42 (1926), 82

FDX 885 — Fast Scarlet Base NTR (Echtscharlach TR Base)

37085 C.I. Azoic Diazo Component 11



4-Chloro-*o*-toluidine hydrochloride
or free base according to type

Chlorination of *o*-acetotoluidide and saponification (BIOS 986)

Discoverer — Wagner 1921

Fundamental Patents

See C.I.37000

Stabilised Diazo Salt

I.G., BP 269212; GP 499294, 448728, (*Fr.* 16, 1651; 15, 577)

Other References

Gr.-El., GP 421205 (*Fr.* 14, 1490)

Diserens, Vol. I, Part 1, p. 438–9

Diserens (Eng. Transl. 1948), Vol. 1, p. 383–4

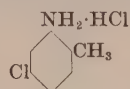
Rowe & Levin, JSDC, 42 (1926), 82

BIOS 986, 119–126

FIAT 764 — Echartrot TR Base

Echartrotsalz TR

37090 C.I. Azoic Diazo Component 32



5-Chloro-*o*-toluidine hydrochloride
or free base according to type

(1) Nitration of *p*-chlorotoluene and reduction of the 4-chloro-2-nitrotoluene separated by vacuum fractionation

(2) Chlorination of *o*-nitrotoluene and reduction of the 4-chloro-2-nitrotoluene separated by vacuum fractionation (BIOS 986)

Discoverers — Laska, Zitscher 1924

Fundamental Patents

See C.I.37000

Stabilised Diazo Salt

Ossenbeck, Tietze 1932

I.G., GP 593260 (*Fr.* 20, 1227)

Other References

I.G., GP 467545, 490882, (*Fr.* 16, 896, 915)

Diserens, Vol. I, Part 1, p. 436–7

Diserens (Eng. Transl. 1948), Vol. 1, p. 382

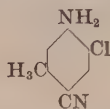
Rowe & Levin, JSDC, 41 (1925), 354

BIOS 986, 107–114, 117–118

FIAT 764 — Echartrot KB Base

Echartrotsalz KB

37095 Azoic Diazo Component



Stabilised diazo salt of 4-amino-5-chloro-*o*-tolunitrile

Preparation of the Base

Reduction of 5-chloro-4-nitro-*o*-tolunitrile

Discoverers — Laska, Zitscher, Heil 1936

Fundamental Patents

See C.I.37000

Stabilised Diazo Salt

I.G., GP 553787 (*Fr.* 18, 1067)

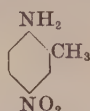
Other References

I.G., BP 481748; USP 2180297; GP 678498 (*Fr.-Bayer, I-1, 45*), 510479, (*Fr.* 17, 989)

BIOS 1149, 31–33 — Fast Red F3G Base

FIAT 764 — Echartrotsalz F3G

37100 C.I. Azoic Diazo Component 34



4-Nitro-*o*-toluidine

Nitration of *o*-benzenesulfonotoluidide and hydrolysis

Discoverers — Laska, Zitscher 1921

Fundamental Patents

See C.I.37000

Stabilised Diazo Salt

I.G., GP 478031 (*Fr.* 16, 900)

Other References

Gr.-El., GP 385955 (*Fr.* 14, 1020)

FIAT 764 — Echartrot RL Base

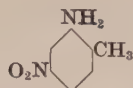
Echartrotsalz RL

Diserens, Vol. I, Part 1, p. 438–9

Diserens (Eng. Transl. 1948), Vol. 1, p. 385

Rowe & Levin, JSDC, 40 (1924), 218

37105 C.I. Azoic Diazo Component 12



5-Nitro-*o*-toluidine

Nitration of *o*-toluidine in conc. H₂SO₄

Discoverers — Winther, Laska, Zitscher 1911

Fundamental Patents

See C.I.37000

Stabilised Diazo Salt

I.G., BP 269212; GP 499294, 553787, 448728, (*Fr.* 16, 1651; 18, 1067; 15, 577)

Other References

Soc. 81 (1902), 1333

FIAT 764 — Echtscharlachsatz G

Echtscharlach G Base neu

Diserens, Vol. I, Part 1, p. 428-9

Diserens (Eng. Transl. 1948), Vol. 1, p. 372

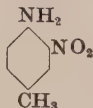
Rowe & Levin, *JSDC*, 40 (1924), 218

37107 Azoic Diazo Component



p-Toluidine

37110 C.I. Azoic Diazo Component 8



2-Nitro-*p*-toluidine

Nitration of *p*-acetotoluidide in H₂SO₄ and saponification

Discoverers — Winther, Laska, Zitscher 1911

Fundamental Patents

See C.I.37000

Stabilised Diazo Salt

I.G., BP 269212; GP 499294, 448728, (*Fr.* 16, 1651; 15, 577)

Other References

Gr.-El., BP 6379/12; USP 1034853, 1127027, 1193566; GP 256999 (*Fr.* 11, 462)

Joyce, *J. Ind. Eng. Chem.*, 13 (1921), 947; cf. *JSDC*, 37 (1921), 310

Diserens, Vol. I, Part 1, p. 436-7

Diserens (Eng. Transl. 1948), Vol. 1, p. 381

Rowe & Levin, *JSDC*, 40 (1924), 218

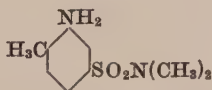
Rowe & Levin, *JSDC*, 41 (1925), 354

FIAT 764 — Echtröt GL Basf

Echtrötsalz GL

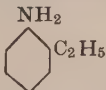
37111 Azoic Diazo Component 132

Stabilised diazo salt of



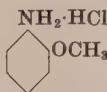
3-Amino-*N,N*-dimethyl-*p*-toluenesulfonamide

**37112 Azoic Diazo Component
C.I. Azoic Brown 28 (Component)**



o-Ethyl aniline

37115 Azoic Diazo Component



o-Anisidine hydrochloride

or free base according to type

Reduction of *o*-nitroanisole

Discoverers — Winther, Laska, Zitscher 1912

Fundamental Patents

See C.I.37000

Stabilised Diazo Salt

A corresponding stabilised diazo salt is not marketed

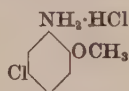
Other References

Gr.-El., GP 258654 (*Fr.* 11, 465)

Rowe & Levin, *JSDC*, 40 (1924), 218

Diserens (Eng. Transl. 1948), Vol. 1, p. 388 — Fast Red BB base

37120 C.I. Azoic Diazo Component 10



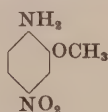
5-Chloro-*o*-anisidine hydrochloride

or free base according to type

Reduction of 4-chloro-2-nitroanisole

Discoverers — Winther, Laska, Zitscher 1912
Fundamental Patents
 Gr.-El., BP 7676/1913; GP 261594 (*Fr.* 11, 466)
Stabilised Diazo Salt
 I.G., GP 454894, 448728, (*Fr.* 15, 569, 577)
Other References
Diserens, Vol. I, Part 1, p. 440-1
Diserens (Eng. Transl. 1948), Vol. 1, p. 386
 BIOS 986, 69-72, 98-99
 FIAT 764 — Echtrotsalz RC

37125 C.I. Azoic Diazo Component 5

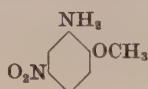


4-Nitro-*o*-anisidine

Nitration of *o*-acetaniside and hydrolysis

Discoverers — Soc. Alsacienne Prod. Chim. 1897
 Winther, Laska, Zitscher 1911
Fundamental Patents
 See C.I.37000
Stabilised Diazo Salt
 I.G., BP 269212; GP 499294, 448728, 553787, (*Fr.* 16, 1651; 15, 577; 18, 1067)
Other References
 Soc. Als. Prod. Chim., BP 25756/97; FP 271908; GP 98637 (*Fr.* 5, 67)
 Freyss, *Bull. Soc. Ind. Mulhouse*, 66 (1900), 375, 382
Diserens, Vol. I, Part 1, p. 440-1
Diserens (Eng. Transl. 1948), Vol. 1, p. 387
 Rowe & Levin, *JSDC*, 40 (1924), 218
 Rowe & Levin, *JSDC*, 41 (1925), 354
 BIOS 986, 278-285
 FIAT 764 — Echtror B Base
 Echtrotsalz B neu

37130 C.I. Azoic Diazo Component 13

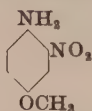


5-Nitro-*o*-anisidine

- (1) Partial reduction of 2,4-dinitroanisole
- (2) Nitration of *o*-anisidine (BIOS 986)
- (3) By-product in manufacture of 5-nitro-2-aminoanisole

Discoverers — Winther, Laska, Zitscher 1911
Fundamental Patents
 See C.I.37000
Stabilised Diazo Salt
 I.G., GP 454894, 448728, (*Fr.* 15, 569, 577)
Other References
Diserens, Vol. I, Part 1, p. 428-9
Diserens (Eng. Transl. 1948), Vol. 1, p. 373
 Rowe & Levin, *JSDC*, 40 (1924), 218
 Rowe & Levin, *JSDC*, 41 (1925), 354
 BIOS 986, 271-278
 FIAT 764 — Echtscharlach R Base
 Echtscharlachsatz R kz.

37135 C.I. Azoic Diazo Component 1

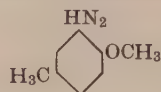


2-Nitro-*p*-anisidine

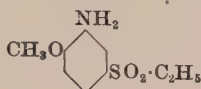
Nitration of *p*-acetaniside and hydrolysis

Discoverers — Laska, Zitscher 1923
Fundamental Patents
 See C.I.37000
Stabilised Diazo Salt
 Gr.-El., GP 399060 (*Fr.* 14, 1030)
 I.G., GP 454894, 448728, (*Fr.* 15, 569, 577)
Other References
Diserens, Vol. I, Part 1, p. 444-5
Diserens (Eng. Transl. 1948), Vol. 1, p. 390-1
 FIAT 764 — Echtbordo GP Base
 Echtbordosalz GP kz.

37136 Azoic Diazo Component
C.I. Azoic Red 83 (Component)



5-Methyl-*o*-anisidine

37140 C.I. Azoic Diazo Component 295-Ethylsulfonyl-*o*-anisidine

Ethylation of 3-acetamido-4-methoxybenzenesulfinic acid, sodium salt, with ethyl chloride and hydrolysis (BIOS 1149)

Discoverers — Modersohn, Schleifenbaum 1934

Fundamental Patents

I.G., GP 636353 (Fr. 23, 764)

Gr.-El., GP 475553, 480814, (Fr. 16, 898, 907)

Stabilised Diazo Salt

I.G., GP 454894, 448728, (Fr. 15, 569, 577)

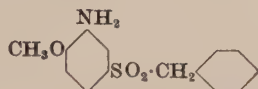
Other References

Semard, *Teintex*, 4, 76

BIOS 1149, 40-43

FIAT 764 — Echtrot GTR Base

Echtrotsalz GTR

37145 C.I. Azoic Diazo Component 315-Benzylsulfonyl-*o*-anisidine

Benzylation of 3-acetamido-4-methoxybenzenesulfinic acid, sodium salt, with benzyl chloride and hydrolysis (BIOS 1149)

Discoverers — Modersohn, Schleifenbaum 1934

Fundamental Patents

Gr.-El., GP 475553, 480814, (Fr. 16, 898, 907)

Stabilised Diazo Salt

I.G., GP 454894, 448728, (Fr. 15, 569, 577)

Other References

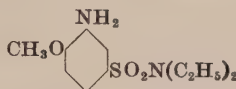
I.G., BP 435817; GP 636353, (Fr. 23, 764)

Diserens (Eng. Transl. 1948), Vol. 1, p. 375

Semard, *Teintex*, 4, 76

BIOS 1149, 23-27

FIAT 764 — Echtscharlachsatz LG

37150 C.I. Azoic Diazo Component 42*N*¹,*N*¹-Diethyl-4-methoxymetanilamide

Condensation of *N*-acetyl-4-methoxymetanil chloride with diethylamine and hydrolysis

Discoverers — Neelmeier, Lamberz 1931

Fundamental Patents

Gr.-El., GP 475553, 480814, (Fr. 16, 898, 907)

Also see C.I.37000

Stabilised Diazo Salt

I.G., GP 454894, 448728, (Fr. 15, 569, 577)

Other References

I.G., BP 391468; USP 1976187; GP 575216 (Fr. 19, 1613)

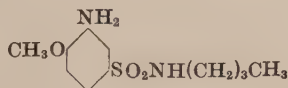
Diserens, Vol. I, Part 1, p. 442-3

Diserens (Eng. Transl. 1948), Vol. 1, p. 389

BIOS 1149, 28-31

FIAT 764 — Echtrot ITR Base

Echtrotsalz ITR

37151 C.I. Azoic Diazo Component 14*N*¹-Butyl-4-methoxymetanilamide

Condensation of *N*-acetyl-4-methoxymetanil chloride with butylamine and hydrolysis

Discoverer — Ernst Fischer 1934

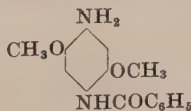
Fundamental Patents

I.G., BP 425839; USP 2025582, 2186226; GP 639305 (Fr. 23, 766)

Other References

Lubs, p. 204 — Fast Red PDC Base

PB 548-561 — Echrot SW Base

37155 C.I. Azoic Diazo Component 24

4'-Amino-2',5'-dimethoxybenzanilide

Condensation of 2,5-dimethoxyaniline with benzoyl chloride, nitration and reduction (BIOS 1149)

Discoverers — Glietenberg, Neelmeier, Rimele 1928

Fundamental Patents

See C.I.37000

Stabilised Diazo Salt

I.G., GP 454894 (Fr. 15, 569)

Other References

I.G., BP 303383; GP 486190 (Fr. 16, 913)

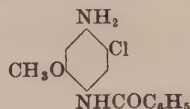
Diserens, Vol. I, Part 1, p. 452-3

Diserens (Eng. Transl. 1948), Vol. 1, p. 399

BIOS 1149, 54-60

FIAT 764 — Echtblau RR Base

Echtblausatz RR

37160 C.I. Azoic Diazo Component 434'-Amino-5'-chloro-*o*-benzanisidide

Nitration of 5-chloro-*o*-formanisidide, hydrolysis to 5-chloro-4-nitro-*o*-anisidine, condensation with benzoyl chloride, and reduction (BIOS 1149)

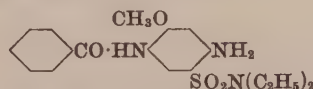
Discoverers — Glietenberg, Neelmeier, Rimele 1928
Fundamental Patents
See C.I.37000

Stabilised Diazo Salt
I.G., GP 454894, 448728, (Fr. 15, 569, 577)

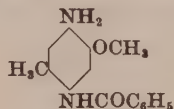
Other References
I.G., USP 1498417, 1878543; GP 486190, 556866, 561400, (Fr. 16, 913; 18, 456, 454)
Semard, *Teintex*, 4, 76
BIOS 1149, 48-51
FIAT 764 — Echkorin LB Base
Echkorinthsalz LB

37161 Azoic Diazo Component

Stabilised diazo salt of

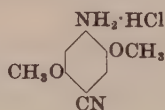
4'-Amino-5'-diethylsulfamoyl-*o*-benzanisidide

Fast Rubine D Salt (Fran)

37165 C.I. Azoic Diazo Component 414'-Amino-6'-methyl-*m*-benzanisidide

Condensation of cresidine with benzenesulfonyl chloride, nitration, reduction, condensation of the newly formed amino group with benzoyl chloride, and selective hydrolysis of the sulfonamide in sulfuric acid (BIOS 1157)

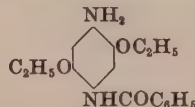
Discoverers — Glietenberg, Neelmeier, Rimele 1928
Fundamental Patents
See C.I.37000
Stabilised Diazo Salt
I.G., GP 454894 (Fr. 15, 569)
Other References
I.G., BP 303838; USP 1878543; GP 486190, 556866, (Fr. 16, 913; 18, 456)
Diserens, Vol. I, Part 1, p. 366 and 450-1
Diserens (Eng. Transl. 1948), Vol. 1, p. 396
BIOS 1157, 36
FIAT 764 — Echtviolett B Base
Echtviolettsalz B

37170 C.I. Azoic Diazo Component 40

Stabilised diazo salt of 4-amino-2,5-dimethoxybenzonitrile

Hydrolysis of 2',5'-dimethoxy-4'-nitro-benzanilide (cf. C.I.37155), Sandmeyer reaction with sodium cyanide to obtain 2,5-dimethoxy-4-nitrobenzonitrile, and reduction with sodium disulfide (BIOS 1149)

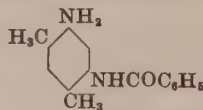
Discoverers — Laska, Zitscher, Heil 1936
Fundamental Patents
See C.I.37000
Stabilised Diazo Salt
I.G., GP 553787 (Fr. 18, 1067)
Other References
I.G., BP 481748; USP 2180297; GP 678498, 510479, (Fr. 17, 989)
BIOS 1149, 44-48
FIAT 764 — Echkordosalz BD

37175 C.I. Azoic Diazo Component 20

4'-Amino-2',5'-diethoxybenzanilide

Condensation of 2,5-diethoxyaniline with benzoyl chloride, nitration, and reduction (BIOS 1149)

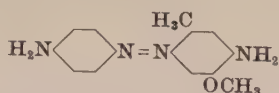
Discoverers — Glietenberg, Neelmeier, Rimele 1928
Fundamental Patents
See C.I.37000
Stabilised Diazo Salt
I.G., GP 454894 (Fr. 15, 569)
Other References
I.G., GP 486190 (Fr. 16, 913)
Semard, *Teintex*, 4, 76
Diserens, Vol. I, Part 1, p. 454-5
Diserens (Eng. Transl. 1948), Vol. 1, p. 399-400
BIOS 1149, 61-64
FIAT 764 — Echkblau BB Base

37180 C.I. Azoic Diazo Component 15

5'-Amino-2,4-benzoxylidide

Condensation of 5-nitro-2,4-xylydine with benzoyl chloride and reduction (FIAT 764)

Discoverers — Glietenberg, Neelmeier, Rimele 1929
Fundamental Patents
See C.I.37000
Stabilised Diazo Salt
A corresponding stabilised diazo salt is not marketed
Other References
I.G., BP 347774; USP 1878543; GP 556866 (Fr. 18, 456)
Rowe, *JSDC*, 42 (1926), 227
FIAT 764 — Echkrot RBE Base

37185 Azoic Diazo Component

Coupling of diazotised *p*-nitroaniline with cresidine and reduction

Discoverers — Laska, Zitscher 1922

Fast Black C Base (Gr-E)

Fundamental Patents

See C.I.37000

Stabilised Diazo Salt

A corresponding stabilised diazo salt was not marketed

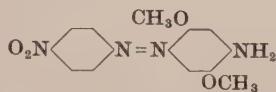
Other References

Gr.-El., BP 211752; GP 390740 (Fr. 14, 1036)

FIAT 764 — Echtschwarz C Base

37190 C.I. Azoic Diazo Component 38

Stabilised diazo salt of



The corresponding base is not marketed

Preparation of the Base

Coupling of diazotised *p*-nitroaniline with 2,5-dimethoxyaniline

Discoverers — Laska, Zitscher 1923

Fundamental Patents

See C.I.37000

Stabilised Diazo Salt

I.G., GP 454894, 448728, (Fr. 15, 569, 577)

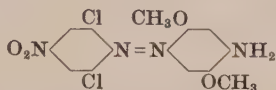
Other References

Gr.-El., GP 392077 (Fr. 14, 1039)

FIAT 764 — Echtschwarzsatz K

37195 C.I. Azoic Diazo Component 51

Stabilised diazo salt of



The corresponding base is not marketed

Preparation of the Base

Coupling of diazotised 2,6-dichloro-4-nitroaniline with 2,5-dimethoxyaniline

Discoverers — Schnitzspahn, Jörg 1935

Fundamental Patents

See C.I.37000

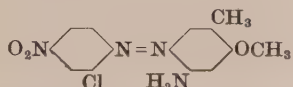
Stabilised Diazo Salt

I.G., GP 454894, 448728, (Fr. 15, 569, 577)

Other References

I.G., BP 458370; GP 648374, 392077, (Fr. 14, 1039; 24, 633)

FIAT 764 — Echtdunkelblausatz R

37200 C.I. Azoic Diazo Component 21

Coupling of diazotised 2-chloro-4-nitroaniline with 4-methyl-*m*-anisidine

Discoverers — Hoffa, Heyna 1933

Fundamental Patents

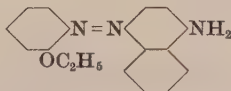
See C.I.37000

Stabilised Diazo Salt

I.G., GP 609334 (Fr. 21, 863)

Semard, Teintex, 4 (1939), 76

FIAT 764 — Echtbraun V Base

37205 C.I. Azoic Diazo Component 23

Coupling of diazotised *o*-phenetidine with 1-naphthylamine

Discoverers — Laska, Zitscher 1921

Fundamental Patents

See C.I.37000

Stabilised Diazo Salt

A corresponding stabilised diazo salt was not marketed

Other References

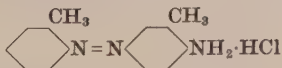
Gr.-El., BP 203032; USP 1452083; GP 383903, 386754, (Fr. 14, 1032, 1034)

Rowe & Levin, JSDC, 40 (1924), 218

FIAT 764 — Echtschwarz LB Base

37210 C.I. Azoic Diazo Component 4

See also 11160 C.I. Solvent Yellow 3 (Yellow)



or acid sulfate or free base according to type

Coupling of diazotised *o*-toluidine with *o*-toluidine

Discoverers — Schnitzspahn, Jung 1932

Fundamental Patents

See C.I.37000

Stabilised Diazo Salt

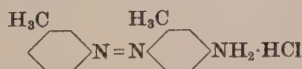
I.G., BP 399753; GP 448728, 586354, (Fr. 15, 577; 20, 1225)

Other References

FIAT 764 — Echtgranat GBC Base

Echtgranatsalz GBC

Diserens (Eng. Transl. 1948), Vol. 1, p. 392

37215 C.I. Azoic Diazo Component 27

or free base according to type

Coupling of diazotised *m*-toluidine with *m*-toluidine

Discoverers — Schnitzspahn, Jung 1932

Fundamental Patents

See C.I.37000

Stabilised Diazo Salt

I.G., BP 399753; GP 448728, 587644, (Fr. 15, 577; 20, 1226)

Other References

Rowe & Levin, JSDC, 41 (1925), 354

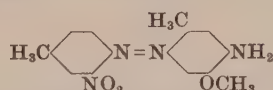
FIAT 764 — Echtgranat GC Base

Echtgranatsalz GC

Diserens (Eng. Transl. 1948), Vol. 1, p. 394

37220 C.I. Azoic Diazo Component 39

Stabilised diazo salt of



The corresponding base is not marketed

Preparation of the BaseCoupling of diazotised 2-nitro-*p*-toluidine with cresidine (5-methyl-*o*-anisidine)*Discoverers* — Laska, Zitscher 1922*Fundamental Patents*

See C.I.37000

Stabilised Diazo Salt

I.G., GP 454894, 448728, (Fr. 15, 569, 577)

Other References

I.G., BP 214516; USP 1498417; GP 392077 (Fr. 14, 1039)

FIAT 764 — Echtkorinthsalz V kz.

37225 C.I. Azoic Diazo Component 112

Benzidine

Reduction of nitrobenzene to hydrazobenzene and rearrangement with acids

Discoverers — Laska, Zitscher, Kunert 1912*Fundamental Patents*

See C.I.37000

Stabilised Diazo Salt

A corresponding stabilised diazo salt is not marketed

Other References

Gr.-El., BP 17279/13; GP 251233, 260998, 268542, (Fr. 11, 467, 468, 470)

37230 C.I. Azoic Diazo Component 113*o*-TolidineReduction of *o*-nitrotoluene to 1,2-di-*o*-tolylhydrazine and rearrangement with acids*Discoverers* — Laska, Zitscher, Kunert 1911*Fundamental Patents*

See C.I.37000

Stabilised Diazo Salt

A corresponding stabilised diazo salt is not marketed

Other References

As for C.I.37225 above

37235 C.I. Azoic Diazo Component 48*o*-DianisidineReduction of *o*-nitroanisole to 1,2-bis(*o*-methoxyphenyl)hydrazine and rearrangement with acids*Discoverers* — Laska, Zitscher, Kunert 1911*Fundamental Patents*

See C.I.37000

Stabilised Diazo Salt

I.G., GP 454894, 448728, (Fr. 15, 569, 577)

Other References

Gr.-El., BP 13766; GP 251233, 262694, (Fr. 11, 467, 469)

Diserens, Vol. I, Part 1, p. 454-5*Diserens* (Eng. Transl. 1948), Vol. 1, p. 400-1

FIAT 764 — Echtblausalz B

37240 C.I. Azoic Diazo Component 22*N*-phenyl-*p*-phenylenediamine

Reduction of 4-nitrosodiphenylamine

Discoverers — Laska, Zitscher, Hoffa, Thoma, Christ, Petzold, 1927 (cf. C.I.37255 and GP 508585)*Fundamental Patents*

See C.I.37000

Stabilised Diazo Salt

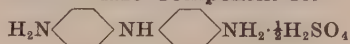
Diazonium chloride

References

I.G., GP 508585, 620460, 534639, 598772, 531474, 534643, 536069, (Fr. 17, 967; 22, 839; 18, 954; 21, 1406; 17, 1004, 1005, 1007)

Diserens, Vol. I, Part 1, p. 365 and 452-3*Diserens* (Eng. Transl. 1948), Vol. 1, p. 398

FIAT 764 — Variaminblausalz RT

37245 C.I. Azoic Diazo Component 109

4,4'-Diaminodiphenylamine half sulfate

or free base according to type

Reduction of 4,4'-dinitrodiphenylamine

Discoverers — Laska, Zitscher, Kunert 1911*Fundamental Patents*

See C.I.37000

Stabilised Diazo Salt

I.G., GP 454894 (Fr. 15, 569)

Other References

Gr.-El., GP 260998, 268542, (Fr. 11, 468, 470)

FIAT 764 — Echtschwarz B Base

37250 C.I. Azoic Diazo Component 47Stabilised diazo salt of 2-methoxy-*N*⁴-phenyl-*p*-phenylenediamine

The corresponding base is not marketed

Preparation of the Base

Reduction of 3-methoxy-4-nitrosodiphenylamine

Discoverers — Laska, Zitscher 1932*Fundamental Patents*

See C.I.37000

Stabilised Diazo Salt

Diazonium chloride

References

I.G., BP 416579; FP 751653; GP 592201, 588782, 601962, 508585, 620460, 534639, 598772, 531474, 534643, 536069, (Fr. 20, 453, 1090; 21, 859; 17, 967; 22, 839; 18, 954; 21, 1406; 17, 1004, 1005, 1007)

FIAT 764 — Variaminblausalz FG

37255 C.I. Azoic Diazo Component 35

N-(*p*-Methoxyphenyl)-*p*-phenylenediamine half sulfate

or free base according to type

Condensation of *p*-anisidine with 2-chloro-5-nitrobenzenesulfonic acid, reduction, and desulfonation of the resulting 5-amino-2-*p*-anisidino-benzenesulfonic acid (see *PB* 74025, *fr.* 1006-10)

Discoverers — Laska, Zitscher, Hoffa, Thoma, Christ, Petzold 1927

Fundamental Patents

See C.I.37000

Stabilised Diazo Salt

Diazonium chloride

References

I.G., *GP* 508585, 532685, 534639, 598772, 531474, 534643, 536069, (*Fr.* 17, 967; 18, 941, 954; 21, 1406; 17, 1004, 1005, 1007)

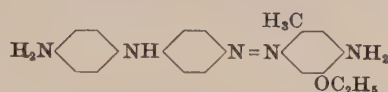
Rowe, *JSDC*, 42 (1926), 227

FIAT 764 — Variaminblau B

Variaminblausalz B

37260 C.I. Azoic Diazo Component 45

Stabilised diazo salt of



The corresponding base is not marketed

Coupling of tetrazotised 4,4'-diaminodiphenylamine with one mol. of 5-methyl-*o*-phenetidine, diazotisation of the amino group, and isolation of the diazo salt as the zinc chloride complex

Discoverer — Haller 1923

Fundamental Patents

See C.I.37000

Stabilised Diazo Salt

I.G., *GP* 454894 (*Fr.* 15, 569)

Other References

I.G., *GP* 433211, 390740, (*Fr.* 15, 552; 14, 1036)

FIAT 764 — Echtschwarzsatz G

37265 C.I. Azoic Diazo Component 114

1-Naphthylamine

Reduction of 1-nitronaphthalene

Discoverers — Winther, Laska, Zitscher, Kunert, Acker 1913

Fundamental Patents

Gr.-El., *BP* 17279/1913; *USP* 1099108; *GP* 268542, 279314, 285664, (*Fr.* 11, 470; 12, 180, 365)

Stabilised Diazo Salt

A corresponding stabilised diazo salt is not marketed

Other References

Rowe & Levin, *JSDC*, 40 (1924), 218

Diserens (Eng. Transl. 1948), Vol. 1, p. 393

FIAT 764 — Echtgranat B Base

37270 Azoic Diazo Component

2-Naphthylamine

Action of ammonium bisulfite on 2-naphthol — i.e. the Bucherer reaction

Discoverers — Winther, Laska, Zitscher, Kunert, Acker 1913

Base Pour Ecarlate Solide B (Fran)

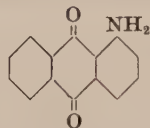
Fundamental Patents

See C.I.37000

Other References

Gr.-El., *BP* 17279/1913; *USP* 1099108; *GP* 268542 (*Fr.* 11, 470)

M.L.B., *GP* 29067 (*Fr.* 1, 549)

37275 C.I. Azoic Diazo Component 36

Stabilised diazo salt of 1-aminoanthraquinone

The corresponding base is not marketed

Preparation of the Base

Reduction of 1-nitroanthraquinone

Discoverers — Laska, Zitscher 1914

Fundamental Patents

Gr.-El., *BP* 10085; *USP* 1121026

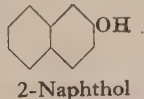
Stabilised Diazo Salt

I.G., *USP* 1572715; *GP* 448728 (*Fr.* 15, 577)

Other References

Beilstein, 14, p. 177

FIAT 764 — Echtrotsalz AL

**37500 C.I. Azoic Coupling Component 1
C.I. Developer 5**

2-Naphthol

Sulfonation of naphthalene to 2-naphthalenesulfonic acid. Fusion with caustic soda, and final precipitation with hydrochloric acid or carbon dioxide

Slightly soluble in water

Easily soluble in many organic solvents

NaOH — almost colourless solution

M.p. — 123°C

B.p. — 286°C

Discoverers — As a coupling agent for Azoic dyes
Read, Holliday & Sons 1880

References

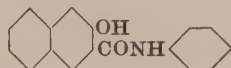
There are very many references to the use of this compound as a coupling agent for the production of azoic dyes in the earlier literature, but as 2-naphthol has now been almost completely superseded by the newer types of coupling agents for this purpose it is felt that the following general references should suffice for the Colour Index

Grandmougin, *Rév. Gen. Mat. Col.* 11 (1907), 252

Montavon, *Rév. Gen. Mat. Col.* 24 (1920), 21; cf. *JSDC*, 36 (1920), 151

Everest & Wallwork, *JSDC*, 44 (1928), 101

Cain & Thorpe, 7th Ed., 125, 339

37505 C.I. Azoic Coupling Component 2

3-Hydroxy-2-naphthanilide

Condensation of aniline with 3-hydroxy-2-naphthoic acid

Soluble in hot nitrobenzene
 Sparingly soluble in alcohol
 Insoluble in water
 NaOH — yellow solution
 Na₂CO₃ — insoluble
 M.p. — 243–4°C

Discoverers — Winther, Laska and Zitscher 1911

References

Product

Gr.-El., *USP* 1101111Gr.-El., *GP* 293897 (*Fr.* 12, 912)Schöpf, *Ber.* 25 (1892), 2740

Dyes Derived

Gr.-El., *BP* 3313 (1914); *USP* 1099108, 1122564; *GP* 256999,
 251233, 260998, 261594, 262694, 268542, 279314, 285664,
 (*Fr.* 11, 462, 467, 468, 466, 469, 470; 12, 180, 365)

Other References

Rowe & Levin, *JSDC*, 40 (1924), 218Rowe & Giles, *JSDC*, 51 (1935), 287*FIAT* 1313, III, p. 593 (X-ray diffraction pattern)*Ibid.*, p. 154*FIAT* 764 — Naphthol AS**37510 C.I. Azoic Coupling Component 10**

4'-Chloro-3-hydroxy-2-naphthanilide

Condensation of *p*-chloroaniline with 3-hydroxy-2-naphthoic acid

Soluble in *o*-dichlorobenzene
 Insoluble in water
 NaOH — yellow solution
 Na₂CO₃ — insoluble
 M.p. — 258–9°C

Discoverers — Winther, Laska and Zitscher 1911

References

Product

Gr.-El., *USP* 1101111; *GP* 293897 (*Fr.* 12, 912)

Dyes Derived

Gr.-El., *GP* 258654 (*Fr.* 11, 465)

Other References

Rowe, *JSDC*, 42 (1926), 227*FIAT* 764 — Naphthol AS-E**37511 C.I. Azoic Coupling Component 22**

3'-Chloro-3-hydroxy-2-naphthanilide

Condensation of *m*-chloroaniline with 3-hydroxy-2-naphthoic acid

Same discoverers and patents as for C.I.37510

Naphthol AS-MCA

37515 C.I. Azoic Coupling Component 17

3-Hydroxy-3'-nitro-2-naphthanilide

Condensation of *m*-nitroaniline with 3-hydroxy-2-naphthoic acid

Soluble in acetic acid
 Insoluble in water
 NaOH — yellow solution
 Na₂CO₃ — insoluble
 M.p. — 246–7°C

Discoverers — Winther, Laska and Zitscher 1911

References

Product

Gr.-El., *USP* 1101111; *GP* 264527 (*Fr.* 12, 910)

Dyes Derived

Gr.-El., *GP* 258654 (*Fr.* 11, 465)

Other References

Rowe & Levin, *JSDC*, 40 (1924), 218Rowe & Giles, *JSDC*, 51 (1935), 287*FIAT* 764 — Naphthol AS-BS**37516 C.I. Azoic Coupling Component 27**

3-Hydroxy-4'-nitro-2-naphthanilide

Condensation of *p*-nitroaniline with 3-hydroxy-2-naphthoic acid

Same discoverers and patents as for C.I.37515

Naphthol AS-AN

Other References

Diserens (Eng. Transl. 1948), Vol. 1, p. 351

37520 C.I. Azoic Coupling Component 18
C.I. Developer 21



3-Hydroxy-2-naphtho-*o*-toluidide

Condensation of *o*-toluidine with 3-hydroxy-2-naphthoic acid

Soluble in solvent naphtha
Insoluble in water
NaOH — yellow solution
Na₂CO₃ — insoluble
M.p. — 195–6°C

Discoverers — Winther, Laska and Zitscher 1911

References

Product

Gr.-El., *USP* 1101111; *GP* 293897 (*Fr.* 12, 912)

Dyes Derived

Gr.-El., *GP* 421205 (*Fr.* 14, 1490)

I.G., *GP* 746454 (*Fr.-Bayer*, 1–1, 293)

Other References

Rowe & Levin, *JSDC*, 42 (1926), 82

FIAT 1313, II, p. 248

FIAT 764 — Naphthol AS-D

37521 C.I. Azoic Coupling Component 31



3-Hydroxy-2-naphtho-*p*-toluidide

Condensation of *p*-toluidine with 3-hydroxy-2-naphthoic acid

Same discoverers and patents (except *GP* 746454) as for C.I.37520

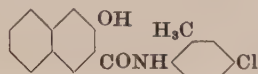
Naphthol AS-RT

Other References

Diserens (Eng. Transl. 1948), Vol. 1, p. 354

M.p. — 222°C

37525 C.I. Azoic Coupling Component 8



4'-Chloro-3-hydroxy-2-naphtho-*o*-toluidide

Condensation of 4-chloro-*o*-toluidine with 3-hydroxy-2-naphthoic acid

Soluble in pyridine
Insoluble in water
H₂SO₄ — nearly colourless solution
NaOH — yellow solution
Na₂CO₃ — insoluble
M.p. — 244–5°C

Discoverer — Wagner 1921

References

Product

Gr.-El., *USP* 1101111; *GP* 293897 (*Fr.* 12, 912)

Dyes Derived

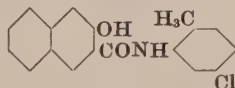
Gr.-El., *GP* 421205 (*Fr.* 14, 1490)

Other References

FIAT 1313, II, p. 249

FIAT 764 — Naphthol AS-TR

37526 C.I. Azoic Coupling Component 21



5'-Chloro-3-hydroxy-2-naphtho-*o*-toluidide

Condensation of 5-chloro-*o*-toluidine with 3-hydroxy-2-naphthoic acid

M.p. — 237°C

Discoverer — Wagner 1921

Naphthol AS-KB

References

Product

Gr.-El., *USP* 1101111; *GP* 293897 (*Fr.* 12, 912)

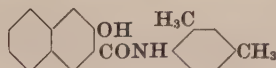
Dyes Derived

Gr.-El., *GP* 421205 (*Fr.* 14, 1490)

I.G., *BP* 199771; *USP* 1622690

FIAT 764 — Naphthol 30992

37527 C.I. Azoic Coupling Component 29



3-Hydroxy-2-naphtho-2,4-xylylide

Condensation of 2,4-xylylidine with 3-hydroxy-2-naphthoic acid

Naphthol AS-MX

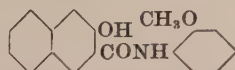
References

Product

Pratt, *Chemistry and Physics of Organic Pigments* (1947), p. 57

M.p. — 223–5°C

37530 C.I. Azoic Coupling Component 20
C.I. Developer 22



3-Hydroxy-2-naphtho-*o*-anisidide

Condensation of *o*-anisidine with 3-hydroxy-2-naphthoic acid

Soluble in alcohol
Insoluble in water
NaOH — yellow solution
Na₂CO₃ — slightly soluble
M.p. — 167–8°C

Discoverers — Laska and Zitscher 1922

References

Product

Gr.-El., *USP* 1101111; *GP* 293897 (*Fr.* 12, 912)

Dyes Derived

Gr.-El., *GP* 390627 (*Fr.* 14, 1022)

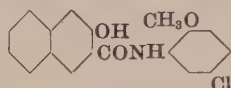
Other References

Hopper, McGregor & Wilson, *JSDC*, 55 (1939), 449

Herrmann, *Melliand Textilber.* 29 (1948), 99

Rowe, *JSDC*, 42 (1926), 227

FIAT 764 — Naphthol AS-OL

37531 C.I. Azoic Coupling Component 34 and 415'-Chloro-3-hydroxy-2-naphth-*o*-aniside

Condensation of 5-chloro-*o*-anisidine with 3-hydroxy-2-naphthoic acid

M.p. — 218°C

Discoverers — Laska and Zitscher 1922

References**Product**

Gr.-El., *USP* 1101111; *GP* 293897 (*Fr.* 12, 912)

Dyes Derived

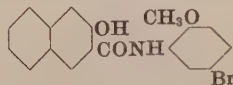
Gr.-El., *USP* 1457114 (also 1935 reissue No. 19527 to I.G.); *GP* 390627 (*Fr.* 14, 1022)

M.L.B., *BP* 193834; *USP* 1549822

Other References

Diserens (Eng. Transl. 1948), Vol. 1, p. 355

FDX 885 — Naphthol 30769 (*PB* 74741, frames 8739–40)

37532 C.I. Azoic Coupling Component 65'-Bromo-3-hydroxy-2-naphth-*o*-aniside

Condensation of 5-bromo-*o*-anisidine with 3-hydroxy-2-naphthoic acid

Brenthol BA**References**

Horsfall & Lawrie, *The Dyeing of Textile Fibres* (2nd Edn. 1949),

p. 113

FDX 885

M.p. — 220°C

37535 C.I. Azoic Coupling Component 113-Hydroxy-2-naphth-*p*-aniside

Condensation of *p*-anisidine with 3-hydroxy-2-naphthoic acid

Discoverers — Laska and Zitscher 1921

References**Product**

Gr.-El., *USP* 1101111; *GP* 293897 (*Fr.* 12, 912)

Dyes Derived

Gr.-El., *GP* 385955 (*Fr.* 14, 1020)

Other References

Hopper, McGregor & Wilson, *JSDC*, 55 (1939), 449.

Rowe & Levin, *JSDC*, 40 (1924), 218

Rowe & Giles, *JSDC*, 51 (1935), 287

BIOS-MISC 55, p. 108

FIAT 764 — Naphthol AS-RL

Soluble in pyridine

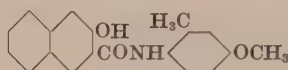
Insoluble in water

H₂SO₄ — weakly brownish solution

NaOH — yellow solution

Na₂CO₃ — insoluble

M.p. — 229–30°C

37540 C.I. Azoic Coupling Component 243-Hydroxy-2'-methyl-2-naphth-*p*-aniside

Condensation of 2-methyl-*p*-anisidine with 3-hydroxy-2-naphthoic acid

Discoverers — Laska and Zitscher 1922

References**Product**

Gr.-El., *USP* 1101111; *GP* 293897 (*Fr.* 12, 912)

Dyes Derived

I.G., *GP* 522295, 616290, 614603, (*Fr.* 17, 980; 22, 829, 820)

Other References

Hopper, McGregor & Wilson, *JSDC*, 55 (1939), 449

Herrmann, *Melliand Textilber.* 29 (1948), 99

FIAT 1313, II, p. 249

FIAT 764 — Naphthol AS-LT

Soluble in butyl alcohol; soluble in pyridine

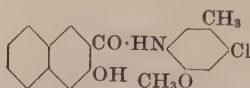
Insoluble in water

H₂SO₄ — brownish-yellow solution

NaOH — yellow solution, green fluorescence

Na₂CO₃ — insoluble

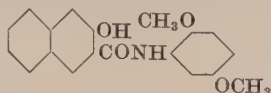
M.p. — 196–7°C

37541 C.I. Azoic Coupling Component 284'-Chloro-3-hydroxy-5'-methyl-2-naphtho-*o*-aniside

Condense 3-hydroxy-2-naphthoyl chloride with 4-chloro-5-methyl-*o*-anisidine in pyridine

Reference

Nair, Srinivasan and Venkataraman, *Tetrahedron*, 11 (1960), 143

37545 C.I. Azoic Coupling Component 19

3-Hydroxy-2',5'-dimethoxy-2-naphthanilide

Condensation of 2,5-dimethoxyaniline with 3-hydroxy-2-naphthoic acid

Soluble in pyridine
Insoluble in water
 H_2SO_4 — yellow solution
 NaOH — yellow solution
 Na_2CO_3 — somewhat soluble
M.p. — 181°C

Discoverers — Laska and Zitscher 1922

References

Product

Gr.-El., *USP* 1101111; *GP* 293897 (*Fr.* 12, 912)

Dyes Derived

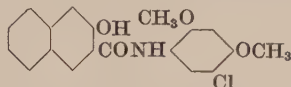
Gr.-El., *GP* 390627 (*Fr.* 14, 1022)

Other References

Hopper, McGregor & Wilson, *JSDC*, 55 (1939), 449

Rowe, *JSDC*, 42 (1926), 227

FIAT 764 — Naphthol AS-BG

37550 C.I. Azoic Coupling Component 12

5'-Chloro-3-hydroxy-2',4'-dimethoxy-2-naphthanilide

Condensation of 5-chloro-2,4-dimethoxyaniline with 3-hydroxy-2-naphthoic acid

Soluble in pyridine
Insoluble in water
 H_2SO_4 — yellow solution, green fluorescence
 NaOH — yellow solution
 Na_2CO_3 — insoluble
M.p. — $193-4^\circ\text{C}$

Discoverers — Laska and Zitscher 1928

References

Product

Gr.-El., *USP* 1101111; *GP* 293897 (*Fr.* 12, 912)

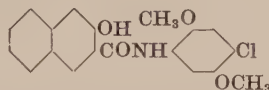
Dyes Derived

I.G., *GP* 552282, 575216, 587652, 614895, 614893, (*Fr.* 19, 1637, 1613; 20, 1081; 22, 826, 822)

Other References

Hopper, McGregor & Wilson, *JSDC*, 55 (1939), 449

FIAT 764 — Naphthol AS-ITR

37555 C.I. Azoic Coupling Component 23

4'-Chloro-3-hydroxy-2',5'-dimethoxy-2-naphthanilide

Condensation of 4-chloro-2,5-dimethoxyaniline with 3-hydroxy-2-naphthoic acid

Soluble in pyridine
Insoluble in water
 H_2SO_4 — yellow solution, green fluorescence
 NaOH — yellow solution
 Na_2CO_3 — insoluble
M.p. — $188-9^\circ\text{C}$

Discoverers — Laska and Zitscher 1928

References

Product

Gr.-El., *USP* 1101111; *GP* 293897 (*Fr.* 12, 912)

Dyes Derived

I.G., *GP* 520241, 614894, 614896, (*Fr.* 17, 979; 22, 824, 828)

Other References

Hopper, McGregor & Wilson, *JSDC*, 55 (1939), 449

FIAT 764 — Naphthol AS-LC

37558 C.I. Azoic Coupling Component 143-Hydroxy-2-naphtho-*o*-phenetidine

Condensation of *o*-phenetidine with 3-hydroxy-2-naphthoic acid

M.p. — $157-8^\circ\text{C}$

Discoverers — Laska and Zitscher 1922

References

Product

Gr.-El., *USP* 1101111; *GP* 293897 (*Fr.* 12, 912)

Dyes Derived

Gr.-El., *USP* 1457114 (also 1935 reissue No. 19527 to I.G.); *GP* 390627 (*Fr.* 14, 1022)

Other References

FIAT 764 — Naphthol AS-PH (erroneously printed AS-FH)

37559 C.I. Azoic Coupling Component 30 and 463-Hydroxy-2-naphtho-*p*-phenetidine

Condensation of *p*-phenetidine with 3-hydroxy-2-naphthoic acid

Discoverers — Laska and Zitscher 1921

References

Product

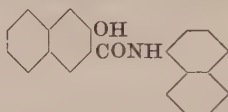
Gr.-El., *USP* 1101111; *GP* 293897 (*Fr.* 12, 912)

Dyes Derived

Gr.-El., *BP* 200739; *FP* 556111; *Sw.P* 101613; *GP* 385955 (*Fr.* 14, 1020)

Other References

Diserens (Eng. Transl. 1948), Vol. 1, p. 358 (Ciba Naphthol RPH)

37560 C.I. Azoic Coupling Component 43-Hydroxy-*N*-1-naphthyl-2-naphthamide

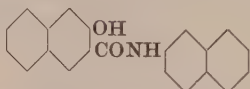
Condensation of 1-naphthylamine with 3-hydroxy-2-naphthoic acid

Soluble in xylene
 Insoluble in water
 NaOH — yellow solution
 Na₂CO₃ — insoluble
 M.p. — 222–3°C

Discoverers — Winther, Laska and Zitscher 1911*References**Product*Gr.-El., USP 1101111; GP 293897 (*Fr.* 12, 912)*Dyes Derived*Gr.-El., GP 399060 (*Fr.* 14, 1030)*Other References*Rowe & Levin, *JSDC*, 40 (1924), 218Rowe & Giles, *JSDC*, 51 (1935), 287

FIAT 1313, II, p. 248

FIAT 764 — Naphthol AS-BO

37565 C.I. Azoic Coupling Component 7**C.I. Developer 23**3-Hydroxy-*N*-2-naphthyl-2-naphthamide

Condensation of 2-naphthylamine with 3-hydroxy-2-naphthoic acid

Soluble in chlorobenzene
 Insoluble in water
 NaOH — yellow solution
 Na₂CO₃ — insoluble
 M.p. — 243–4°C

Discoverers — Winther, Laska and Zitscher 1911*References**Product*Gr.-El., USP 1101111; GP 256999, 293897, (*Fr.* 11, 462; 12, 912)Strohbach, *Ber.* 34 (1901), 4152*Dyes Derived*I.G., GP 475553, 467545, 490882, (*Fr.* 16, 898, 896, 915).*Other References*Rowe & Levin, *JSDC*, 40 (1924), 218Nuttall, *Am. Dyestuff Rep.* 38 (1949), 232

FIAT 1313, III, p. 593 (X-ray diffraction pattern)

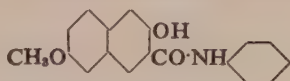
FIAT 764 — Naphthol AS-SW

37566 C.I. Azoic Coupling Component 457-Bromo-3-hydroxy-2-naphth-*o*-anisidideCondensation of *o*-anisidine with 7-bromo-3-hydroxy-2-naphthoic acid*References*

BIOS 988 — Naphthol 31855

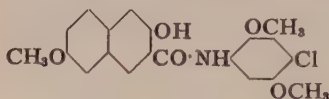
FDX 885 — Naphtol 31855 (*PB* 74741, fr. 8743)

M.p. — 189–90°C

37567 C.I. Azoic Coupling Component 113

7-Methoxy-3-hydroxy-2-naphthanilide

Condense aniline with 7-methoxy-3-hydroxy-2-naphthoic acid

37568 C.I. Azoic Coupling Component 1117-Methoxy-3-hydroxy-2-naphtho-*o*-toluidideCondense *o*-toluidine with 7-methoxy-3-hydroxy-2-naphthoic acid**37569 C.I. Azoic Coupling Component 112**

7-Methoxy-3-hydroxy-4-chloro-2',5'-dimethoxy-2-

naphthanilide
 Condense 4-chloro-2,5-dimethoxyaniline with 7-methoxy-3-hydroxy-2-naphthoic acid

37570 C.I. Azoic Coupling Component 403,3''-Dihydroxy-4',4'''-bi-2-naphtho-*o*-toluidideCondensation of *o*-toluidine with 3-hydroxy-2-naphthoic acid

Soluble in butyl alcohol; soluble in pyridine

Insoluble in water

H₂SO₄ — brown solution

NaOH — brownish yellow solution

Na₂CO₃ — insoluble

M.p. — 327°C

Discoverers — Laska and Zitscher 1911*References**Product*Gr.-El., USP 1101111; GP 293897 (*Fr.* 12, 912)*Dyes Derived*Gr.-El., GP 256999 (*Fr.* 11, 462)*Other References*

FIAT 764 — Naphthol AS-BM

37575 C.I. Azoic Coupling Component 33,3''-Dihydroxy-4',4'''-bi-2-naphtho-*o*-anisidideCondensation of *o*-dianisidine with 3-hydroxy-2-naphthoic acidSoluble in *o*-nitrotoluene

Insoluble in water

H₂SO₄ — brownish yellow solution, green fluorescence

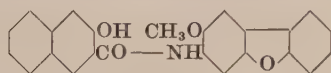
NaOH — brownish yellow solution

Na₂CO₃ — insoluble

M.p. — 348°C

Discoverer — Zitscher 1923*References**Product*Gr.-El., USP 1101111; GP 293897 (*Fr.* 12, 912)*Dyes Derived*Gr.-El., GP 402868 (*Fr.* 14, 1024)*Other References*Richards, *Jentgen's Kunstseide u. Zellwolle*, 24 (1942), 614

FIAT 764 — Naphthol AS-BR

37580 C.I. Azoic Coupling Component 323-Hydroxy-*N*-(2-methoxy-3-dibenzofuryl)-2-naphthamide

Condensation of 3-amino-2-methoxydibenzofuran with 3-hydroxy-2-naphthoic acid

Soluble in pyridine

Insoluble in water

H₂SO₄ — yellow solution

NaOH — yellow solution

Na₂CO₃ — insoluble

M.p. — 207–211°C

Discoverers — Zahn and Schimmelschmidt 1936*References**Product*

I.G., BP 472823; GP 718348

*Dyes Derived*I.G., BP 472823; GP 720853 (*Fr.-Bayer*, I-1, 29)*Other References**Deut. Wollen-Gewerbe*, 71 (1939), 113

BIOS-MISC 55, p. 108

FIAT 1313, II, p. 249

BIOS 1149, p. 84

FIAT 764 — Naphthol AS-S

37585 C.I. Azoic Coupling Component 363-Hydroxy-2-*o*-anthrotoluidideCondensation of *o*-toluidine with 3-hydroxy-2-anthroic acid

Soluble in butyl alcohol; soluble in pyridine

Insoluble in water

H₂SO₄ — yellowish-brown solution

NaOH — reddish-orange solution

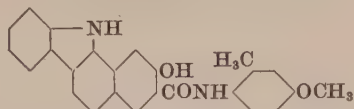
Na₂CO₃ — insoluble

M.p. — 270°C

Discoverers — Gassner and Meiser 1930*References**Product*I.G., BP 367907; GP 554786 (*Fr.* 19, 1902)*Dyes Derived*I.G., BP 383967; GP 549983 (*Fr.* 19, 1609)*Other References*Hopper, McGregor & Wilson, *JSDC*, 55 (1939), 449*Diserens* (Eng. Transl. 1948), Vol. 1, p. 359

FIAT 1313, I, p. 392; II, p. 248

FIAT 764 — Naphthol AS-GR

37590 C.I. Azoic Coupling Component 25

2-Hydroxy-2'-methyl-11H-benzo(a)carbazole-3-carbox-p-aniside

Condensation of 2-methyl-p-anisidine with 2-hydroxy-11H-benzo(a)carbazole-3-carboxylic acid

Soluble in nitrobenzene; soluble in pyridine
Sparingly soluble in butyl alcohol
Insoluble in water
H₂SO₄ — yellowish-brown solution
NaOH — yellowish-brown solution
Na₂CO₃ — insoluble
M.p. — 306–8°C

Discoverers — Schmelzer, Ballauf and Hefner 1929

References**Product**

Production of 2-hydroxy-11H-benzo(a)carbazole-3-carboxylic acid

See

I.G., GP 514420 (Fr. 17, 737)

Dyes Derived

I.G., GP 539116 (Fr. 18, 949)

Other References

Desai & Mehta, *JSDC*, **54** (1938), 422

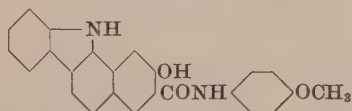
Semard, *Teintex*, **4** (1939), 76

BIOS 1149, p. 95

BIOS-MISC, 55, p. 108

FIAT 1313, II, p. 248 (incorrectly shown as the 5-methyl-aniside instead of the 2-methyl-p-aniside)

FIAT 764 — Naphthol AS-SR

37595 C.I. Azoic Coupling Component 13

2-Hydroxy-11H-benzo(a)carbazole-3-carbox-p-aniside

Condensation of p-anisidine with 2-hydroxy-11H-benzo(a)carbazole-3-carboxylic acid

Soluble in pyridine
Insoluble in water
H₂SO₄ — brownish-yellow solution
NaOH — brownish-yellow solution
Na₂CO₃ — insoluble
M.p. — 324–6°C

Discoverers — Ballauf, Schmelzer and Hefner 1929

References**Product**

Production of 2-hydroxy-11H-benzo(a)carbazole-3-carboxylic acid

See

I.G., GP 514420 (Fr. 17, 737)

Dyes Derived

I.G., GP 539116 (Fr. 18, 949)

Other References

Desai & Mehta, *JSDC*, **54** (1935), 422

Semard, *Teintex*, **4** (1939), 76

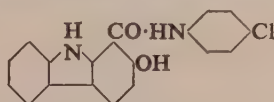
Diserens (Eng. Transl. 1948), Vol. 1, p. 358

BIOS 1149, p. 95

BIOS-MISC 55, p. 108

FIAT 1313, III, pp. 153, 593 (X-ray diffraction pattern)

FIAT 764 — Naphthol AS-SG

37600 C.I. Azoic Coupling Component 15

4'-Chloro-2-hydroxy-1-carbazolecarboxanilide

Condensation of p-chloroaniline with 2-hydroxy-1-carbazolecarboxylic acid

Soluble in butyl alcohol; soluble in pyridine
Insoluble in water
H₂SO₄ — brownish-yellow solution
NaOH — yellow solution, green fluorescence
Na₂CO₃ — sparingly soluble
M.p. — 258–9°C

Discoverers — Schmelzer, Ballauf and Muth 1928

References**Product**

Production of 2-hydroxy-3-carbazolecarboxylic acid

See

I.G., BP 303901; GP 512234 (Fr. 17, 734)

Dyes Derived

I.G., BP 343164; GP 551880 (Fr. 19, 1627)

Other References

Desai & Mehta, *JSDC*, **54** (1938), 422

Jochi Kamat and Rone, *J. Chem. Soc. (C)* (1964) 1518.

Semard, *Teintex*, **4** (1939), 76

Herrmann, *Melliand Textilber.* **29** (1948), 99

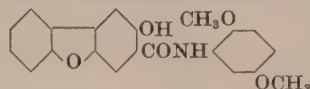
Diserens (Eng. Transl. 1948), Vol. 1, p. 360

BIOS-MISC 55, p. 108

BIOS 1149, p. 114

FIAT 1313, I, p. 392, II, p. 249

FIAT 764 — Naphthol AS-LB

37605 C.I. Azoic Coupling Component 16

2-Hydroxy-2',5'-dimethoxy-3-dibenzofurancarboxanilide

Condensation of 2,5-dimethoxyaniline with 2-hydroxy-3-dibenzofurancarboxylic acid

Soluble in pyridine
Insoluble in water
H₂SO₄ — yellow solution
NaOH — yellow solution
Na₂CO₃ — insoluble
M.p. — 217°C

Discoverer — Muth 1932

References**Product**

I.G., BP 426403; USP 2157797; GP 607381 (Fr. 21, 275)

Dyes Derived

I.G., BP 426564; FP 768053; USP 2026908; GP 594326 (Fr. 20, 1125)

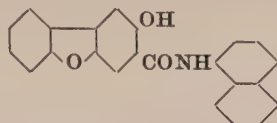
Other References

Melliand *Textilber.* **18** (1937), 728

Semard, *Teintex*, **4** (1939), 76

BIOS 1149, p. 85–93

FIAT 764 — Naphthol AS-BT

37608 C.I. Azoic Coupling Component 37

2-Hydroxy-*N*-1-naphthyl-3-dibenzofurancarboxamide

Condense 2-hydroxy-3-dibenzofurancarboxylic acid with 1-naphthylamine in chlorobenzene (containing 5% dimethylformamide) with thionyl chloride

Reference

Nair, Srinivasan and Venkataraman, *Tetrahedron*, **11** (1960), 143

37610 C.I. Azoic Coupling Component 5

4,4'-Bi-*o*-acetoacetotoluidide

- (1) Condensation of *o*-tolidine with ethyl acetoacetate
- (2) Addition of *o*-tolidine to ketene dimer (Boese)

Soluble in alcohol; soluble in benzene
Insoluble in water
H₂SO₄ — colourless solution
NaOH — colourless solution
M.p. — 204–5°C

Discoverers — Laska and Zitscher 1921

*References**Product*

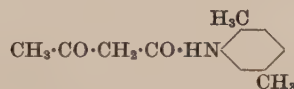
Gr.-El., *BP* 211772; *GP* 415032 (*Fr.* **14**, 1487)
CCCC., *USP* 2152132, 2152786, 2152787

Dyes Derived

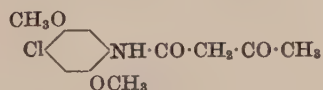
Gr.-El., *BP* 210217; *USP* 1505568; *GP* 386054 (*Fr.* **14**, 1006)

Other References

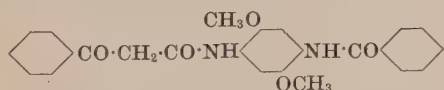
Hopper, McGregor & Wilson, *JSDC*, **55** (1939), 449
Boese, *Ind. Eng. Chem.* **32** (1940), 16
Herrmann, *Melliand Textilber.* **29** (1948), 99
Rowe & Levin, *JSDC*, **40** (1924), 218
FIAT 764 — Naphthol AS-G

37611 C.I. Azoic Coupling Component 42

2,5-Acetoacetoxyilide

37613 C.I. Azoic Coupling Component 44

4-Chloro-2,5-dimethoxyacetoacetanilide

37614 Azoic Coupling Component

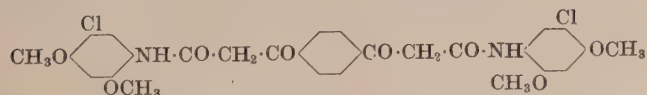
4'- α -Benzoylacetamido-2',5'-dimethoxybenzanilide

Condensation of 4'-amino-2',5'-dimethoxybenzanilide with ethyl benzoylacetate

Naphthol AS-IFG (IG)*References*

BIOS 1149, p. 132

M.p. — 166–7°C

37615 C.I. Azoic Coupling Component 35

α, α' -Terephthaloylbis[5-chloro-2,4-dimethoxyacetanilide]

Condensation of 5-chloro-2,4-dimethoxyaniline with diethyl terephthaloyldiacetate

Discoverers — Henle and Kracker 1930

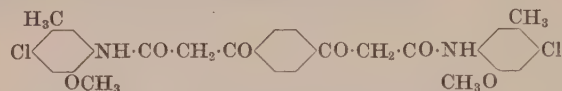
*References**Dyes Derived*

I.G., *BP* 365351; *GP* 556479 (*Fr.* **19**, 1620)

Other References

Desai & Mehta, *JSDC*, **54** (1938), 422
Hopper, McGregor & Wilson, *JSDC*, **55** (1939), 449
Diserens (Eng. Transl. 1948), Vol. **1**, p. 362
FIAT 764 — Naphthol AS-LG

Soluble in pyridine
Insoluble in water
H₂SO₄ — yellow solution
NaOH — colourless solution
M.p. — 253–4°C

37620 C.I. Azoic Coupling Component 33

α, α' -Terephthaloylbis[4-chloro-5-methyl-*o*-acetanisidide]

Condensation of 4-chloro-5-methyl-*o*-anisidine with diethyl terephthaloyldiacetate

Soluble in pyridine
 Insoluble in water
 H_2SO_4 — brownish-yellow solution
 NaOH — colourless solution
 M.p. — 245–6°C

Discoverers — Henle and Kracker 1930

References

Dyes Derived

I.G., BP 365351; GP 556479 (*Fr.* 19, 1620)

Other References

Hopper, McGregor & Wilson, *JSDC*, 55 (1939), 449

Diserens (Eng. Transl. 1948), Vol. 1, p. 363

BIOS 1149, p. 82–83, 117–8

FIAT 764 — Naphthol AS-L3G

37625 C.I. Azoic Coupling Component 9

2- α -Acetylacetamido-6-ethoxybenzothiazole

Condensation of 2-amino-6-ethoxybenzothiazole with ethyl acetate

Soluble in butyl alcohol, chloroform, pyridine
 Insoluble in water
 H_2SO_4 — weakly yellowish solution
 NaOH — colourless solution
 M.p. — 205°C

Discoverers — Schrader and Zerwick, 1932

References

Product

I.G., FP 769921; USP 2093214

Dyes Derived

I.G., BP 425168; FP 769922; USP 2030327; GP 600101 (*Fr.* 21, 846)

Other References

Hopper, McGregor & Wilson, *JSDC*, 55 (1939), 449

BIOS 1149, p. 82–83, 117–8

FIAT 764 — Naphthol AS-L4G

NOTES

STILBENE DYES

The stilbene dyes are in most cases mixtures of dyes of indeterminate constitution which result from the condensation of 5-nitro-*o*-toluenesulfonic acid in aqueous caustic alkaline medium either alone or with other aromatic compounds, usually arylamines. Azo and/or azoxy groups are probably the chromophores.

The first products of the self condensation of 5-nitro-*o*-toluenesulfonic acid include 4,4'-dinitro-2,2'-stilbenedisulfonic acid and 4,4'-dinitrobibenzyl-2,2'-disulfonic acid which therefore form convenient starting points for the secondary condensations with arylamines. The largest and probably now the most important class of stilbene dyes consists of such secondary condensations in which the arylamine is an aminoazo compound.

The constitutions and therefore the properties of the stilbene dyes vary with the proportions and concentrations of the reactants, and with the temperature and the duration of heating. Probably no two manufacturers use exactly the same conditions for any given dye. The C.I. dye numbers in this section must therefore be understood to refer not to specific products which can be accurately characterised but to groups of related products which possess closely similar dyeing and fastness properties.

The stilbene dyes are wholly direct dyes, but in some instances have secondary uses as leather, lake-forming or solvent dyes. The hue range is confined essentially to yellow, orange, dull yellowish red, and brown.

The dyes have been arranged in the following sequence —

Dye Numbers

| | |
|-------------|---|
| 40000-40006 | Self condensation products of 5-nitro- <i>o</i> -toluenesulfonic acid, or its derivatives 4,4'-dinitro-2,2'-stilbene-disulfonic acid or 4,4'-dinitrobibenzyl-2,2'-disulfonic acid, and the further products of their treatment with reducing or oxidising agents. |
| 40015-40030 | Condensation products of 5-nitro- <i>o</i> -toluenesulfonic acid (or its derivatives) together with phenols, naphthols or aminophenols. |
| 40045-40070 | Condensation products of 5-nitro- <i>o</i> -toluenesulfonic acid (or its derivatives) together with aromatic amines*. |
| 40205-40295 | Azo-stilbene dyes formed by condensation of 4,4'-dinitro-2,2'-stilbenedisulfonic acid (or 4,4'-dinitrobibenzyl-2,2'-disulfonic acid) with aminoazo compounds*. |
| 40500-40510 | Azo-stilbene dyes formed by diazotisation of a condensation product containing primary amino groups and coupling with azo dye coupling components. |
| 40600-40647 | Colourless derivatives of stilbene used as fluorescent brighteners |

* In these series it is usually not known whether the starting material for a given commercial dye is 4,4'-dinitro-2,2'-stilbenedisulfonic acid, 4,4'-dinitrobibenzyl-2,2'-disulfonic acid or a total alkaline self condensation product of 5-nitro-*o*-toluenesulfonic acid. To avoid repetition the preparations are described as from 4,4'-dinitro-2,2'-stilbene-disulfonic acid unless authentic contrary information is available.

Attention is called to the stilbene-azo dyes of more precise constitution prepared in the usual way by tetrazotisation and coupling of 4,4'-diamino-2,2'-stilbenedisulfonic acid. These are treated as normal azo dyes. See especially C.I.24860-24910.

References

The structure of the stilbene dyes has been the subject of a number of papers, notably by A. G. Green and collaborators, which are collected under the references to C.I.40000.

General accounts of the stilbene dyes are given in

Fierz-David, *Künstliche organische Farbstoffe* (1926), 65
Venkataraman, *Chemistry of Synthetic Dyes*, Vol. 1 (1952), 628

Processes of preparation for a number of stilbene dyes are given in BIOS 1548

40000 C.I. Direct Yellow 11 (Reddish yellow)

A self condensation product of 5-nitro-*o*-toluenesulfonic acid

Heat 5-nitro-*o*-toluenesulfonic acid with aqueous sodium hydroxide. Various yellow dyes or mixtures of dyes are obtained according to the concentration of sodium hydroxide, the temperature and the duration of the reaction, e.g. for Curcumine S the concentration of sodium hydroxide is initially *ca.* 4.5% and is later increased to *ca.* 17.5%, the temperature is of the order of 70°-80°C and duration of reaction *ca.* 5 hr.

H₂SO₄ conc. — deep dull red; on dilution — dull yellow (sometimes with brownish ppt.)
HNO₃ conc. — partial solution (yellowish brown becomes olive)
HCl conc. — partial solution (blackish)
Aqueous solution + H₂SO₄ 10% — darkens;
+ HCl conc. — olive yellow;
+ NaOH conc. — golden orange ppt.
Zinc and ammonia — pale yellowish orange

Discoverers — J. Walter 1883; F. Bender 1885; E. Hepp 1892
Leonhardt, *BP* 4387/86; *USP* 360553; *FP* 175630; *GP* 38725 (Fr. 1, 510)
Kalle Co., *BP* 23672/92; *FP* 226635; *GP* 79241 (Fr. 3, 809)
BIOS 1548, 169 — Curcumine S
FIAT 764 — Diaminechtgelb A
Schultz & Bender, *Ber.* 19 (1886), 3234
Walter, *Bull. Soc. Ind. Mulhouse*, 57 (1887), 99
Fischer & Hepp, *Ber.* 26 (1893), 2233; 28 (1895), 2281; 30 (1897), 2618
Bender, *Ber.* 28 (1895), 422
JSDC, 14 (1898), 203
Elbs & Kremann, *Z. Elektrochem.* 9 (1903), 416
Green & Wahl, *Ber.* 30 (1897), 3097; 31 (1898), 1078
Ris & Simon, *Ber.* 31 (1898), 354
Green, *JCS*, 85 (1904), 1424
Green & Crosland, *JCS*, 89 (1906), 1604, 1608, 1610
Green & Baddiley, *JCS*, 93 (1908), 1722

Typical reactions

Soluble in water (reddish yellow)
Slightly soluble in Cellosolve
Insoluble in other organic solvents

40001 C.I. Direct Yellow 6 (Bright yellow → Reddish yellow)*Discoverer* — Badische Co.

BIOS 1548, 145

FIAT 764 — Stilbengelb 3GX

Typical reactions

Soluble in water (lemon yellow)

Insoluble in ethanol and in other organic solvents

H₂SO₄ conc. — dull red; on dilution — yellowAqueous solution + H₂SO₄ 10% — slightly greener;

+ NaOH dil. — slightly redder

Treat an aqueous solution of C.I.40000 with formaldehyde; or condense 5-nitro-*o*-toluenesulfonic acid in aqueous sodium hydroxide in the presence of formaldehyde; or heat 4,4'-dinitro-2,2'-stilbenedisulfonic acid with aqueous sodium hydroxide solution in the presence of formaldehyde

40002 C.I. Direct Orange 15 (Orange → Reddish orange)*Discoverer* — F. Bender 1888Leonhardt, *BP* 2664/88; *USP* 395115, 396527; *FP* 189697;GP 46252 (*Fr.* 2, 373)

For literature see C.I.40000; also

JSDC, 16 (1900), 58

Treat an aqueous solution of C.I.40000 with an organic reducing agent such as glycerol or glucose; or condense 5-nitro-*o*-toluenesulfonic acid in caustic alkaline medium in the presence of the reducing agent or heat 4,4'-dinitro-2,2'-stilbenedisulfonic acid in caustic alkaline medium in the presence of the reducing agent

Typical reactions

Soluble in water (orange) and Cellosolve

Slightly soluble in ethanol

Insoluble in other organic solvents

H₂SO₄ conc. — reddish blue; on dilution — olive yellow solution to greyish yellow ppt.HNO₃ conc. — yellow to olive solutionAqueous solution + H₂SO₄ 10% — yellowish brown;

+ NaOH conc. — redder

40003 C.I. Direct Orange 15 (Orange → Reddish orange)*Discoverer* — F. Bender 1888

A reduction product of C.I.40000 which probably contains amino groups

Diamine Orange D (C)

Fastness Properties (C): Acid (organic) 3, Alkali 5,

Light 4, 4, 5, Washing 2, Water 3

Dischargeability: Neutral, poor-fair; Alkaline, poor (red residue)

Is very similar in general properties to the dyes listed under

C.I. Direct Orange 15 — C.I.40002

Leonhardt, *BP* 2664/88; *USP* 395115, 396527; *FP* 189697;GP 46252 (*Fr.* 2, 373)

FIAT 764 — Chloraminorange G, Diaminorange D

Treat an aqueous solution of C.I.40000 with sodium sulfide

Very soluble in water (orange brown)

Insoluble in ethanol

H₂SO₄ conc. — corinth; on dilution — olive yellow

Aqueous solution + HCl conc. — brownish olive yellow;

+ NaOH conc. — orange brown ppt.

40004 C.I. Direct Orange 22 (Bright reddish orange)

BIOS Misc. 20, Appendix 18

FIAT 764 — Diaminorange GR

Treat an aqueous solution of C.I.40003 with acetic anhydride
(Probably amino groups are thereby acetylated)

40005 Direct Dye*Discoverer* — Agfa

Treat an aqueous solution of C.I.40000 first with sodium sulfide and then with sodium hypochlorite

Solamine Orange RRL (A)

Fastness Properties (C): Acid (organic) 4, Alkali 5,

Light 4-5, 5, 5, Washing 2, Water 2

FIAT 764 — Solaminorange RRL

H₂SO₄ conc. — violet black; on dilution — olive yellow

Aqueous solution + HCl conc. — brownish olive yellow ppt;

+ NaOH conc. — orange brown

Soluble in water (orange brown)

Insoluble in ethanol

40006 C.I. Direct Yellow 6:1 (Yellow)*Discoverer* — Badische Co.

BIOS 1548, 145

FIAT 764 — Chloraminbraungelb GG, Direktgelb R ex.

Papiergelb F hochkz

An oxidation product of C.I.40000

Treat an aqueous solution of C.I.40000 with sodium hypochlorite

Typical reactions

Soluble in water (lemon yellow)

Insoluble in ethanol

H₂SO₄ conc. — orange brown; on dilution — lemon yellow

Aqueous solution + HCl conc. — lemon yellow to olive yellow;

+ NaOH conc. — lemon yellow to golden orange ppt.

40015 Direct Dye*Discoverer* — F. Bender 1888

Carry out the self condensation of 5-nitro-*o*-toluenesulfonic acid in aqueous caustic alkaline medium as for C.I.40000 but in the presence of a phenol or naphthol such as resorcinol or 1- or 2-naphthol

Leonhardt, *BP* 2664/88; *USP* 395115, 396527; *FP* 189697;GP 46252, 48528, (*Fr.* 2, 373)

No information is available to link any specific commercial dye with this description which is repeated from C.I. 1st Edition

Soluble in water (orange to brown solutions)

H₂SO₄ conc. — red to violet black; on dilution — brown ppts.

Aqueous solution + HCl — brown ppts.

40025 Direct Dye

Carry out the self condensation of 5-nitro-*o*-toluenesulfonic acid in aqueous caustic alkaline medium as for C.I.40000 but in the presence of *p*-aminophenol

The product is a mixture of which one component is probably C.I.24890 (Brilliant Yellow)

Discoverer — C. Ris 1892

Arnica Yellow (Gy)

Fastness Properties (C): Acid, good; Alkali, moderate (redder); Light and washing, moderate
Geigy Co., *FP* 222554; *GP ap.* G7525 (*Fr.* 3, 812)

Soluble in water (brownish yellow)
H₂SO₄ conc. — violet; on dilution — dark brown ppt.
Aqueous solution + HCl — brownish black ppt;
+ NaOH — unaltered

40030 C.I. Direct Yellow 19 (Bright yellow)

Ethylate the hydroxy groups in C.I.40025 by treatment with ethyl chloride under pressure

The product is a mixture of which one component is probably C.I.24895 (Chrysophenine)

Discoverer — C. Ris 1899

Geigy Co., *BP* 6651/99; *USP* 636065; *FP* 222554, 286620; *GP ap.* G7525 (*Fr.* 3, 812), G13069 (*Fr.* 6, 1032)

Soluble in water (slightly reddish yellow) and ethanol
Insoluble in carbon tetrachloride
H₂SO₄ conc. — violet; on dilution — dark brown ppt.

40045 C.I. Direct Yellow 21 (Yellow)

Condensation product of 4,4'-dinitro-2,2'-stilbenedisulfonic acid and aniline

Heat an aqueous caustic alkaline solution of disodium 4,4'-dinitro-2,2'-stilbenedisulfonate with aniline under reflux

H₂SO₄ conc. — reddish orange; on dilution — yellowish brown ppt.
Aqueous solution + HCl — brownish yellow ppt;
+ NaOH — orange yellow ppt.

Discoverers — C. Ris 1897; A. G. Green and A. R. Wahl 1897

Geigy Co., *BP* 18990/97; *USP* 613911; *FP* 269466; *GP* 101760 (*Fr.* 5, 646)

Clayton Aniline Co., *BP* 21399/97, 21553/97; *FP* 273018; *GP* 113514 (*Fr.* 6, 1028)

Green & Wahl, *Ber.* 30 (1897), 3097
Green, *JCS*, 85 (1904), 1429

Soluble in water (pure yellow)
Slightly soluble in ethanol (yellow)

40050 Direct Dye

Condensation product of 4,4'-dinitro-2,2'-stilbenedisulfonic acid and primuline or dehydrothio-*p*-toluidinesulfonic acid

Heat an aqueous caustic alkaline solution of disodium 4,4'-dinitro-2,2'-stilbenedisulfonate with primuline (C.I.49000) or sodium dehydrothio-*p*-toluidinesulfonate under reflux

Discoverers — C. Ris 1897; A. G. Green and A. R. Wahl 1896-7

Curcuphenine (CAC) and Diphenyl Fast Yellow (Gy)

Clayton Aniline Co., *BP* 12922/96, 21399/97, 21553/97; *FP* 264755, 273018; *GP* 99575 (*Fr.* 5, 642), 113514 (*Fr.* 6, 1028)

Geigy Co., *BP* 18990/97; *FP* 269466; *GP* 100613 (*Fr.* 5, 644)
JSDC, 13 (1897), 137

Green, *JCS*, 85 (1904), 1425

Soluble in water (yellow)
Slightly soluble in ethanol
H₂SO₄ conc. — red; on dilution — brownish yellow ppt.
Aqueous solution + HCl — brownish orange to brown ppt;
+ NaOH conc. — no change or orange yellow ppt.

40055 Direct Dye

Heat the total condensation product for C.I.40050 under reflux with glucose and caustic soda

Aqueous solution + HCl — dark ppt;
+ NaOH — unaltered

Discoverers — A. G. Green and A. R. Wahl 1896

Chlorophenine Orange (CAC) (Ciba) — various brands

Clayton Aniline Co., *BP* 12922/96; *FP* 264755; *GP* 100421 (*Fr.* 5, 643)

JSDC, 13 (1897), 137

Soluble in water (orange yellow)
H₂SO₄ conc. — blue; on dilution — dark ppt.

40065 C.I. Direct Orange 28 (Dull reddish orange)

Condensation product of 5-nitro-*o*-toluenesulfonic acid with itself and with *p*-phenylenediamine

Heat an aqueous caustic alkaline solution of sodium 5-nitro-*o*-toluenesulfonate under reflux with *p*-phenylenediamine in the molecular proportions of 2 : 1

H₂SO₄ 10% — insoluble
NaOH 10% — insoluble

Discoverer — C. Ris 1899

Geigy Co., *BP* 6651/99; *USP* 636065; *FP* 286620; *GP ap.* G13069 (*Fr.* 6, 1032)

Compare Clayton Aniline Co., *BP* 21399/97, 21553/97; *FP* 273018; *GP* 113514 (*Fr.* 6, 1028)

Soluble in water (orange)
Slightly soluble in ethanol and Cellosolve
Insoluble in other organic solvents
H₂SO₄ conc. — reddish violet; on dilution — brown ppt.
HNO₃ conc. — partial solution (reddish brown, turns yellow brown)

40066 C.I. Direct Orange 27 (Dull reddish orange)

Condensation product of 5-nitro-*o*-toluenesulfonic acid with itself and with *p*-phenylenediamine

Heat an aqueous caustic alkaline solution of sodium 5-nitro-*o*-toluenesulfonate under reflux with *p*-phenylenediamine in the molecular proportions of 1 : 1

Discoverer — C. Ris 1890

Geigy Co., *BP* 15671/90; *USP* 455952; *FP* 208626; *GP* 59290 (*Fr.* 3, 811)

FIAT 764 — Diaminbraun ATC

Soluble in water (golden orange)
Very slightly soluble in ethanol
H₂SO₄ conc. — bordeaux; on dilution — corinth
Aqueous solution + HCl conc. — dull violet ppt;
+ NaOH conc. — orange brown ppt.

40070 Direct Dye

Condensation product of 5-nitro-*o*-toluenesulfonic acid with itself and with benzidine

Heat an aqueous caustic alkaline solution of sodium 5-nitro-*o*-toluenesulfonate under reflux with benzidine

Discoverer — C. Ris 1892

Chicago Orange G (Gy)

Geigy Co., BP 788/93; USP 601063; FP 227271; GP 75326 (Fr. 3, 812)

Soluble in water (orange yellow)

Insoluble in ethanol

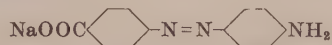
H₂SO₄ conc. — violet; on dilution — brown ppt.

Aqueous solution + HCl — brown ppt;

+ NaOH — orange brown ppt.

40205 C.I. Direct Orange 71 (Reddish orange)

Condensation product of 4,4'-dinitro-2,2'-stilbenedisulfonic acid and the monoazo compound



Heat together under reflux in an aqueous caustic alkaline medium, disodium 4,4'-dinitro-2,2'-stilbenedisulfonate and the sodium salt of *p*-aminobenzoic acid → aniline. Aftertreat the product with glucose and caustic soda

Discoverer — A. Gressly 1932

I.G., BP 403007; USP 1982159; FP 755290; GP 591628 (Fr. 20, 1207)

BIOS 1548, 122

FIAT 764 — Siriuslichtorange GR

Soluble in water (brownish orange)

Very slightly soluble in ethanol (pale golden yellow)

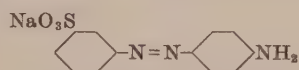
H₂SO₄ conc. — deep blue; on dilution — brown

Aqueous solution + HCl conc. — dark brown ppt;

+ NaOH conc. — brownish orange ppt.

40210 C.I. Direct Orange 61 (Yellowish orange)

Condensation product of 4,4'-dinitro-2,2'-stilbenedisulfonic acid and the monoazo compound



Heat together under reflux in an aqueous caustic alkaline medium, disodium 4,4'-dinitro-2,2'-stilbenedisulfonate and the sodium salt of metanilic acid → aniline

Soluble in water (orange)

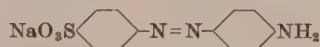
H₂SO₄ conc. — violet; on dilution — yellow

Aqueous solution + HCl — darkens;

+ NaOH — orange ppt.

40215 C.I. Direct Orange 34, 39, 44, 46 and 60 (Yellowish orange → Reddish orange)

Condensation product of 4,4'-dinitro-2,2'-stilbenedisulfonic acid with the monoazo compound



Heat together under reflux in an aqueous caustic alkaline medium, disodium 4,4'-dinitro-2,2'-stilbenedisulfonate and the sodium salt of sulfanilic acid → aniline (C.I.13010)

In different commercial brands different proportions of the reactants are used and in some cases the total product is aftertreated with glucose and caustic soda

Discoverers — A. Gressly 1932; A. Blank and W. Rodionow 1910

Bayer Co., BP 22555/09; USP 951046-9; GP *ap.* F26403 (Fr. 10, 879)

I.G., BP 403007; USP 1982159; FP 755290; GP 591628 (Fr. 20, 1207)

BIOS 1547, 123, 124, 125

FIAT 764 — Siriuslichtorange 2GL, 5G, 7GL

FIAT' 1313, 3, 195

Sirius Supra Orange 7GL

Soluble in water (golden orange)

Slightly soluble in ethanol (pale golden to brownish yellow)

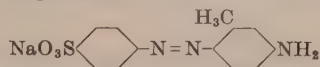
H₂SO₄ conc. — deep blue; on dilution — golden yellow

Aqueous solution + HCl conc. — yellowish olive brown, ppt;

+ NaOH conc. — brownish orange ppt.

40220 C.I. Direct Orange 34* (Yellowish orange)

Condensation product of 4,4'-dinitro-2,2'-stilbenedisulfonic acid with the monoazo compound



Heat together under reflux in an aqueous caustic alkaline medium disodium 4,4'-dinitro-2,2'-stilbenedisulfonate and the sodium salt of sulfanilic acid → *m*-toluidine in the molecular proportions of 1:1.75 (Sirius Supra Orange 7G)

* In part only; many of the brands under C.I. Direct Orange 34 probably have the constitution C.I.40215

Discoverer — A. Gressly 1907

Cassella Co., BP 19807/07; USP 903284; FP 391475; GP 204212 (Fr. 9, 381)

BIOS 1548, 124

FIAT 764 — Diaminechtorange EG, Siriuslichtorange 7G

Soluble in water (yellow to dull orange)

Slightly soluble in ethanol

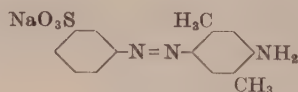
H₂SO₄ conc. — dark blue to bluish black; on dilution — brownish orange

Aqueous solution + HCl conc. — yellowish olive brown ppt;

+ NaOH conc. — brownish orange ppt.

40225 C.I. Direct Orange 35 (Reddish orange)

Condensation product of 4,4'-dinitrobenzyl-2,2'-disulfonic acid and the monoazo compound



Heat together under reflux in an aqueous caustic alkaline medium disodium 4,4'-dinitrobenzyl-2,2'-disulfonate and metanilic acid → 2,5-xyldine

Soluble in water (yellow)

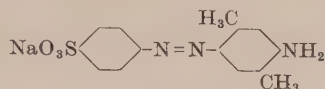
Slightly soluble in ethanol (brownish red) and acetone (brownish yellow)

H₂SO₄ conc. — violet

HCl conc. — brownish yellow solution

40230 C.I. Direct Orange 36 (Yellowish orange)

Condensation product of 4,4'-dinitro-2,2'-stilbenedisulfonic acid and the monoazo compound



Heat together under reflux in aqueous caustic alkaline medium disodium 4,4'-dinitro-2,2'-stilbenedisulfonate and the sodium salt of sulfanilic acid → 2,5-xylylidine

Discoverer — A. Gressly

Cassella Co., BP 19807/07; USP 903284; FP 391475; GP 204212 (Fr. 9, 381)

Soluble in water (orange yellow)

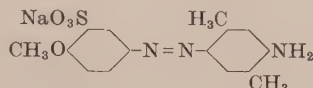
H₂SO₄ conc. — violet brown; on dilution — yellowish brown ppt.

Aqueous solution + HCl — yellowish brown;

+ NaOH conc. — orange yellow

40235 C.I. Direct Orange 41 (Reddish orange)

Condensation product of 4,4'-dinitro-2,2'-stilbenedisulfonic acid and the monoazo dye



Heat together under reflux in aqueous caustic alkaline medium disodium 4,4'-dinitro-2,2'-stilbenedisulfonate and 6-methoxymetanilic acid → 2,5-xylylidine (in molecular proportions of approx. 1 : 1) and aftertreat the product with glucose and caustic soda

Discoverer — A. Gressly 1932

I.G., BP 403007; USP 1982159; FP 755290; GP 591628 (Fr. 20, 1207)

BIOS 1548, 126

FIAT 764 — Siriuslichtorange RRL

FIAT 1313, 3, 194

Soluble in water (brownish orange)

Very slightly soluble in ethanol (pale golden yellow)

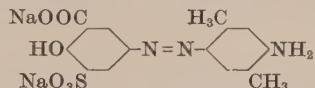
H₂SO₄ conc. — deep blue; on dilution — olive to olive brown (black ppt.)

Aqueous solution + HCl conc. — yellowish olive brown ppt;

+ NaOH conc. — reddish orange brown ppt.

40240 Direct Dye

Condensation product of 4,4'-dinitro-2,2'-stilbenedisulfonic acid and the monoazo compound



Heat together under reflux in aqueous caustic alkaline medium disodium 4,4'-dinitro-2,2'-stilbenedisulfonate and the sodium salt of 5-amino-3-sulfosalicylic acid → 2,5-xylylidine

Discoverer — I.G.

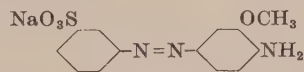
Benzo Fast Chrome Orange R (IG)

BIOS-MISC. 20, Appendix 57

BIOS 961, 91

40245 C.I. Direct Orange 70 (Dull reddish orange)

Condensation product of 4,4'-dinitro-2,2'-stilbenedisulfonic acid and the monoazo compound



Heat together under reflux in aqueous caustic alkaline medium disodium 4,4'-dinitro-2,2'-stilbenedisulfonate and the sodium salt of metanilic acid → *o*-anisidine

Soluble in water and ethanol

Insoluble in acetone

H₂SO₄ conc. — dull bluish green

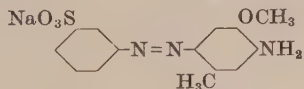
HNO₃ conc. — dull bluish violet

HCl conc. — dull bordeaux

NaOCl (2°Tw) — dull red

40260 C.I. Direct Orange 37 (Reddish orange)

Condensation product of 4,4'-dinitro-2,2'-stilbenedisulfonic acid and the monoazo compound



Heat together under reflux in aqueous caustic alkaline medium disodium 4,4'-dinitro-2,2'-bibenzylidisulfonate and the sodium salt of metanilic acid → cresidine

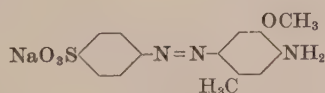
Very soluble in water (golden orange) and ethanol

Slightly soluble in acetone

H₂SO₄ conc. — dark blue

40265 C.I. Direct Orange 37 (Reddish orange)

Condensation product of 4,4'-dinitro-2,2'-stilbenedisulfonic acid and the monoazo compound



Heat together under reflux (or slight pressure) in aqueous caustic alkaline medium disodium 4,4'-dinitro-2,2'-stilbenedisulfonate and the sodium salt of sulfanilic acid → cresidine

In different commercial brands different proportions of reactants are used. In some cases further treatments are applied, e.g. with sodium sulfide

Discoverer — A. Gressly 1907

Cassella Co., BP 19807/07; USP 903284; FP 391475; GP 204212 (Fr. 9, 381)

BIOS 1548, 126

FIAT 764 — Siriuslichtorange 3R

Typical reactions

Soluble in water (orange to orange brown)

Slightly soluble in ethanol

Insoluble in other organic solvents

H₂SO₄ conc. — greyish violet to bluish black; on dilution — yellowish to olive brown

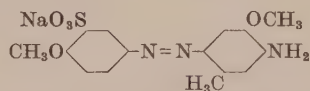
HNO₃ conc. — yellowish olive brown

Aqueous solution + HCl conc. — olive brown to blackish brown;

+ NaOH conc. — orange

40270 C.I. Direct Red 76 (Yellowish red)

Condensation product of 4,4'-dinitro-2,2'-stilbenedisulfonic acid and the monoazo compound



Heat together under reflux (or slight pressure) in aqueous caustic alkaline medium disodium 4,4'-dinitro-2,2'-stilbenedisulfonate and the sodium salt of 6-methoxymetanic acid → cresidine; then further treat the product with glucose and caustic soda

Discoverer — A. Gressly 1932

I.G., BP 403007; USP 1982159; FP 755290; GP 591628 (Fr. 20, 1207)

BIOS 1548, 128

FIAT 764 — Siriuslichtscharlach 2G

Soluble in water (brownish orange to dull red)

Very slightly soluble in ethanol and Cellosolve

Insoluble in other organic solvents

H₂SO₄ conc. — deep blue; on dilution — olive brown (+ blackish ppt.)

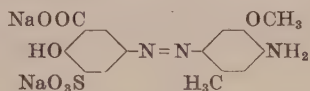
HNO₃ conc. — partial solution (blue)

Aqueous solution + HCl conc. — violet brown ppt;

+ NaOH conc. — orange brown ppt.

40275 C.I. Direct Red 187 (Yellowish red)*

Condensation product of 4,4'-dinitro-2,2'-stilbenedisulfonic acid with the monoazo compound



Heat together under reflux (or slight pressure) in caustic alkaline medium disodium 4,4'-dinitro-2,2'-stilbenedisulfonate and the sodium salt of 5-amino-3-sulfosalicylic acid → cresidine

* Aftertreated with dichromate or chromium fluoride

Discoverers — H. Winkeler and A. Pelz 1938

I.G., BP 483564; USP 2212628, 2248151; FP 862016, 862211;

GP 695630, 719303 (Fr.-Bayer, I-1, 1237)

BIOS 961, 91

BIOS 1548, 155

FIAT 764 — Benzoechtchromrot G

Moderately soluble in water (orange brown)

Insoluble in ethanol

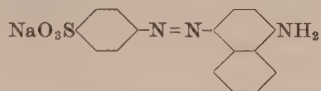
H₂SO₄ conc. — blue black; on dilution — grey brown

Aqueous solution + HCl conc. — dark brown ppt;

+ NaOH conc. — violet ppt.

40290 C.I. Direct Red 111, 112 (Dull yellowish red)**C.I. Direct Brown 78 (Dull reddish orange → Brown)**

Condensation product of 4,4'-dinitro-2,2'-stilbenedisulfonic acid and the monoazo compound



Heat together under reflux (or slight pressure) in aqueous caustic alkaline medium, the sodium salts of 4,4'-dinitro-2,2'-stilbenedisulfonic acid and sulfanilic acid → 1-naphthylamine

In different commercial brands different proportions of reactants are used

Discoverer — A. Gressly 1907

Cassella Co., BP 19807/07; USP 903284; FP 391475; GP 204212 (Fr. 9, 381)

BIOS 1548, 41, 189

FIAT 764 — Diaminechtbraun G, Siriuslichtbraun 3R

Typical reactions

Soluble in water (orange brown)

Slightly soluble in ethanol

H₂SO₄ conc. — bluish black to greyish black; on dilution — yellowish to olive brown

Aqueous solution + HCl conc. — yellowish olive brown ppt;

+ NaOH conc. — brownish orange

40291 C.I. Solvent Brown 39

Salt of a 4,4'-dinitro-2,2'-stilbenedisulfonic acid condensation product and an organic base

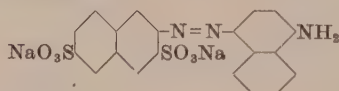
Convert C.I.40290 (in which the reactants are approximately equimolecular) into the dicyclohexylamine salt

Cubana Brown (IG)

FIAT 764 — Cubanabraun R

40295 Direct Dye

Condensation product of 4,4'-dinitro-2,2'-stilbenedisulfonic acid with the monoazo compound



Heat together under reflux (or slight pressure) in an aqueous caustic alkaline medium the sodium salts of 4,4'-dinitro-2,2'-stilbenedisulfonic acid and 3-amino-2,7-naphthalenedisulfonic acid → 1-naphthylamine in approximately equimolecular proportions

Discoverer — A. Gressly 1907

Diamine Fast Brown GB (C)

Fastness Properties (C): Acid (organic) 4, Alkali 5, Light 4, 4, 4-5, Washing 2, Water 2

Dischargeability: neutral, fair (pink residue); alkaline, poor (red residue)

Cassella Co., BP 19807/07; USP 903284; FP 391475; GP 204212 (Fr. 9, 381)

BIOS 1548, 189

FIAT 764 — Diaminechtbraun GB

Soluble in water (yellowish brown)

Slightly soluble in ethanol

H₂SO₄ conc. — grey black (+ magenta red); on dilution — yellowish brown

Aqueous solution + HCl conc. — yellowish olive brown ppt;

+ NaOH conc. — orange brown

40500 Direct Dye

Stilbene azo dye

Diazotise C.I.40065 and couple the product with phenol. Then ethylate the hydroxy groups by heating with ethyl chloride under pressure

Discoverer — C. Ris 1899

Diphenyl Chrysoine RR (Gy)

Dyes cotton reddish orange

Geigy Co., BP 6651/99; USP 644462; FP 286620; GP 117729 (Fr. 6, 1031)

Soluble in water (reddish orange)

H₂SO₄ conc. — blue; on dilution — brownish black ppt.

Aqueous solution + HCl — blackish brown ppt;

+ NaOH — reddish brown ppt.

40505 C.I. Direct Brown 29 (Brown)

Stilbene azo dye

Diazotise C.I.40065 and couple the product with *N,N*-Dimethyl Gamma acid in alkaline medium

Discoverer — C. Ris 1899

Geigy Co., BP 6651/99; USP 644462; FP 286620; GP 117729 (Fr. 6, 1031)

Soluble in water (yellowish orange to brown)

Slightly soluble in Cellosolve

Insoluble in other organic solvents

H₂SO₄ conc. — purple; on dilution — dark brown ppt.

HNO₃ conc. — partial solution (reddish brown)

Aqueous solution + HCl dil. — bluish brown;
+ NaOH conc. — slightly redder

40510 C.I. Direct Brown 34 (Brown)

Stilbene azo dye

Diazotise C.I.40065 and couple the product with *N*-Phenyl Gamma acid in alkaline medium

Discoverer — C. Ris 1899

Geigy Co., BP 6651/99; USP 644462; FP 286620; GP 117729 (Fr. 6, 1031)

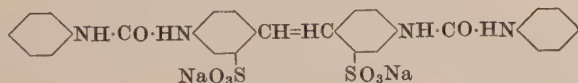
Soluble in water (turbid yellowish brown)

Insoluble in ethanol and acetone

H₂SO₄ conc. — blackish violet; on dilution — greenish brown

Aqueous solution + H₂SO₄ dil. — duller;

+ NaOH conc. — unaltered

40600 C.I. Fluorescent Brightener 30

Treat 4,4'-diamino-2,2'-stilbenedisulfonic acid (1 mol.) with phenylisocyanate (1.5 mol.) in aqueous solution at 40°C

Discoverers — S. Petersen, O. Bayer and B. Wendt 1940

I.G., FP 878155; GP 746569

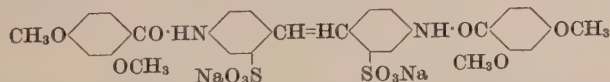
BIOS 259, 3 — Blankophor R, RG

BIOS 574, 158 — Blankophor RG (C.I.40600 with 2.5% Anthralan Green GG (IG) to give a slightly greenish shade

FDX 885 — Blankophor RG

FIAT 1302, 5, 7

Soluble in water (violet fluorescence)

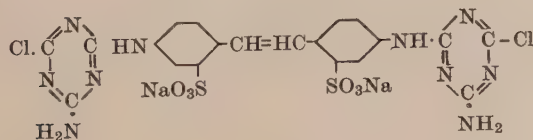
40605 C.I. Fluorescent Brightener 34

React the disodium salt of 4,4'-diamino-2,2'-stilbenedisulfonic acid (1 mol.) with 2,4-dimethoxybenzoic acid (2 mol.) in the presence of phosphorus oxychloride and a tertiary amine, with or without other solvents, at 110–130°C

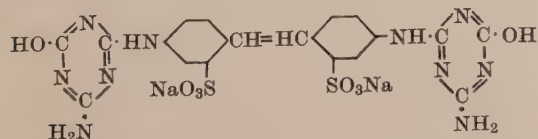
Discoverers — S. E. Krahler and W. V. Wirth 1948

Du Pont Co., USP 2700053

Soluble in water (pure blue fluorescence)

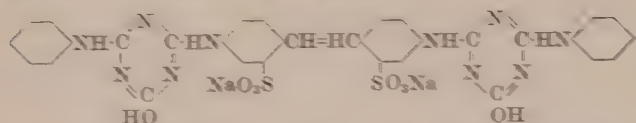
40615 C.I. Fluorescent Brightener 245

Discoverer—Pol

40618 C.I. Fluorescent Brightener 243

Discoverer—Pol

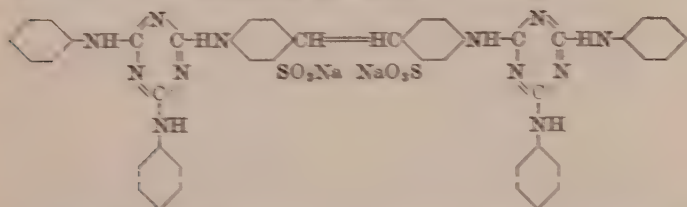
40620 C.I. Fluorescent Brightener 32
Discoverer — B. Wendt 1940

 I.G., *USP* app. APC 381856; *FP* 870470; *GP* 731558
BIOS 1154, 28 — Blankophor B (Ultrasan)
FIAT 1302, 4, App. 4


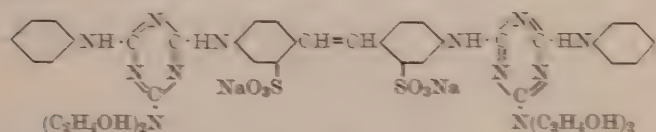
Add an acetone solution of cyanuric chloride (2 mol.) and an aqueous solution of sodium carbonate gradually and simultaneously to an aqueous solution of 4,4'-diamino-2,2'-stilbenedisulfonic acid (1 mol.) at 0°C so that alkalinity is never developed.

React the product with aniline (2 mol.) at 12°C keeping the medium acid. Finally make alkaline with sodium carbonate and heat to 97°C to replace the remaining chlorine atoms by (hydroxyl) groups.

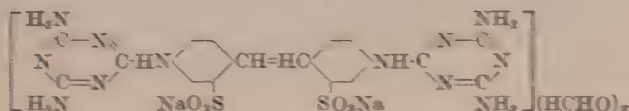
Soluble in water (bluish fluorescence)

40621 C.I. Fluorescent Brightener 9
USP 3382075


Condense the disodium salt of 4,4'-diamino-2,2'-stilbenedisulfonic acid (1 mol.), cyanuric chloride (2 mol.) and aniline (4 mol.)

40622 C.I. Fluorescent Brightener 28


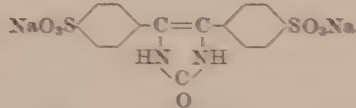
Condense 4,4'-diaminostilbene-2,2'-disulfonic acid (1 mol.) with cyanuric chloride (2 mols.). React the product with aniline (2 mol.) and diethanolamine (2 mols.).

40630 C.I. Fluorescent Brightener 1
Discoverers — E. Keller and R. Zweidler 1943
 Geigy Co., *BP* 595065; *USP* 2473475


Treat the disodium salt of 4,4'-diamino-2,2'-stilbenedisulfonic acid (1 mol.) with cyanuric chloride (2 mol.) and then react with ammonia. Heat the product with aqueous formaldehyde solution, maintaining a weakly alkaline medium, for 1-2 hr. at 70°-80°C.

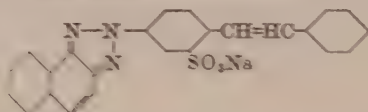
Soluble in water (very pale yellow)

40640 C.I. Fluorescent Brightener 48
Discoverer — I.G.

BIOS 259, 4 — Blankophor WT
BIOS 1239, 7 — Blankophor WT
FIAT 1302, 6


Heat a mixture of benzoin (1 mol.) with urea (2-4 mol.) and sodium hydrogen sulfate (1-8 mol.) under pressure for 10 hr. at 160°C and sulfonate the product.

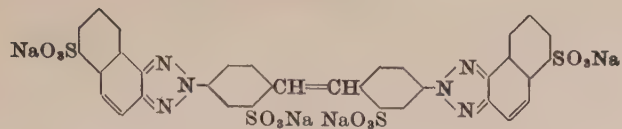
Soluble in water

40645 C.I. Fluorescent Brightener 46
BP 717889, 736452


4-Amino-2-stilbenesulfonic acid → 2-Naphthylamine (or 2-Amino-1-naphthalenesulfonic acid); then oxidise with nitrous acid to form the triazole.

40647 C.I. Fluorescent Brightener 40

Reference
Kasner, *Lehrbuch der organischen Chemie*, 13th Ed., p. 520



4,4'-Diamino-2,2'-stilbenedisulfonic acid \rightleftharpoons
6-Amino-1-naphthalenesulfonic acid;
then oxidise with nitrous acid

NOTES

NOTES

CAROTENOID COLOURING MATTERS

The carotenoids are very powerful colouring matters belonging to the terpene group. The chromophore is a polyene chain of at least 18 carbon atoms with conjugated double bonds.

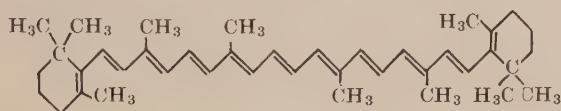
Several carotenoids are widely distributed in nature, and are included in the Natural Colouring Matters section (C.I. 75110–75135). The synthetic carotenoids now available are important food dyes. The synthetic route, starting from β -ionone, is closely related to that for vitamin A, which is produced in the human metabolism of some of the synthetic products.

They are fat soluble but can also be used as stable dispersions in aqueous systems.

Literature

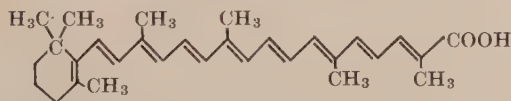
1. Isler, O., Ruegg, R. and Schwieter, U., *Pure and Applied Chemistry*, 14 (1967), 245.
2. U.S. Patents 3,110,598 and 3,206,316.
3. Manz, U., *Chimia* 21 (1967), 329.
4. Menge, W., *Naturwiss*, 28 (1940), 31.
5. Smith, E. L., *J. Gen. Physiol.*, 24 (1940), 565.

40800 C.I. Food Orange 5 (Yellow→Orange) Common name β -carotene (trans.)



See C.I. 75130 for information on the natural carotenes and C.I. 75110, 75125 and 75135 for related colouring matters.
Sparingly soluble in chloroform.

40820 C.I. Food Orange 6 (Orange→Yellowish red) β -Apo-8'-carotenal (C_{30}) (trans.)



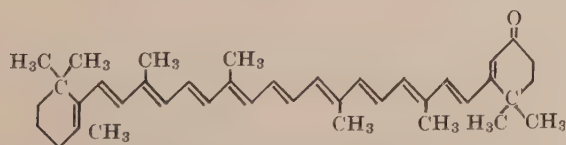
Slightly soluble in ethanol, freely soluble in chloroform.

40825 C.I. Food Orange 7 (Orange)

Ethyl β -apo-8'-carotenoate (C_{30}) (trans.)

Ethylester of C.I. 40820. Freely soluble in chloroform.

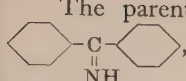
40850 C.I. Food Orange 8 (Yellowish pink→Yellowish red) Common name Canthaxanthin



Soluble in chloroform, almost insoluble in ethanol.

NOTES

DIPHENYLMETHANE COLOURING MATTERS (Ketone Imines)

The parent substance of this class is diphenylmethane, the chromophore is the $\text{C}=\text{NH}$ group, the chromogen is , and the dyes are formed by substitution of alkylamino groups in both *para*-positions to the methane C atom and conversion of the colour base to the salt (hydrochloride).

The three dyes in this class, classically known as Auramines, are all yellow. If the imino group is acetylated the resulting hue is deep violet. This apparent anomaly has been explained in terms of resonance theory.

Despite their low fastness and ease of hydrolysis, these basic dyes have been used for dyeing wool, silk, leather, acrylic fibres, cotton, paper and jute, as well as for the manufacture of pigments.

Special Literature

Semper, *Ann.*, **381** (1911), 234

Fierz-David, *Künstliche Organische Farbstoffe*, Julius Springer, Berlin, 1926

Sidgwick, *Organic Chemistry of Nitrogen* (revised by Taylor & Baker), 1937, p. 96

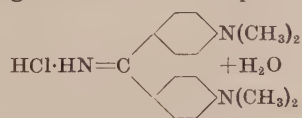
Hodgson, *JSDC*, **62** (1946), 178

Lubs, *The Chemistry of Synthetic Dyes and Pigments*, New York, 1955

41000 C.I. Basic Yellow 2 (*Bright yellow*)

41000:1 (C.I. Solvent Yellow 34) is the free base

41000:2 (C.I. Pigment Green 3 – component) is the PTM salt



(Graebe's formula)

(a) Dissolve sulfur in *p,p'*-methylenebis[*N,N*-dimethylaniline] (Michler's base), add ammonium and sodium chlorides, heat the mixture at 175°C in a current of ammonia, extract the dye with hot water, and salt out (GP 53614)

(b) Heat Michler's ketone [4,4'-bis(dimethylamino)benzophenone] with ammonium and zinc chlorides at 150–160°C (GP 29060)

Note—The free base is made from the above hydrochloride by adding to its aqueous solution about the equimolecular amount of NaOH, Na₂CO₃, or NH₃

Soluble in cold and very soluble in hot water (bright yellow), readily decomposed on boiling

Soluble in ethanol (yellow)

H₂SO₄ conc. — colourless; on dilution — pale yellow

Discoverers — Kern and Caro 1883

Badische Co., BP 5512/84, 5741/84, 9632/84, 12022/86, 12549/89, 16666/90, 6249/93; USP 301802; FP 160990, 164099, 175376, 200613; GP 29060, 31936, 37730, 38433, (Fr. 1, 99, 102, 94, 102), 53614 (Fr. 2, 60), 58277, 70908, 71320 (Fr. 3, 87, 88, 89)

M.L.B., FP 181351; GP 41751 (Fr. 1, 44), 44077 (Fr. 2, 23)

Bayer Co., GP 77329 (Fr. 4, 173)

Fairbrother, Renshaw & BDC, BP 274187

BIOS 959, 2

BIOS 1482, 29

FIAT 1313, 2, 368

FIAT 764 — Auramin O

Graebe, Ber. 20 (1887), 3260; 32 (1899), 1681

Stock, J. prakt. Chem. 47 (1893), 401; Ber. 33 (1900), 297, 318

Walter, Bull. Soc. ind. Mulhouse, 61 (1895), 82; Chem. Ztg. 24 (1900), 1031

von Braun, Ber. 37 (1904), 2670

Grandmougin & Favre-Ambrumyan, Ber. 42 (1909), 2127

Semper, Ann. 381 (1911), 234

Cumming, JCS, 123 (1923), 2459

Holmes & Darling, JACS, 46 (1924), 2343

Piccard, JACS, 48 (1926), 2352

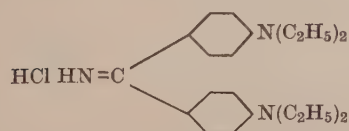
Noll, Papierfabr. 24 (1926), 593; cf. JSDC, 43 (1927), 33

Sidgwick, Organic Chemistry of Nitrogen, 1937, p. 96

Hodgson, JSDC, 62 (1946), 178

Fierz-David, Künstliche Organische Farbstoffe

41001 C.I. Basic Yellow 37 (*Greenish Yellow*)

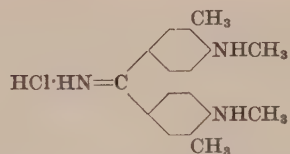


Preparation as for method (a) under C.I. 41000 but using *p,p'*-methylenebis(*N,N*-diethylaniline) instead of Michler's base

American Cyanamid Co., USP 3132178

Lynch and Reid, JACS, 55 (1933), 2515

41005 C.I. Basic Yellow 3 (*Greenish yellow*)



Discoverers — Gnehm and Schmid 1892

Badische Co., *BP* 10465/92; *USP* 488430; *FP* 222275; *GP* 67478
(*Fr.* 3, 90)

BIOS 959, 2

FIAT 1313, 2, 368

FIAT 764 — Auramin G

Gnehm & Wright, *Ber.* 35 (1902), 913

Holmes & Darling, *JACS*, 46 (1924), 2343

Noll, *Papierfabr.* 24 (1926), 593; cf. *JSDC*, 43 (1927), 33

Dissolve sulfur in 4,4'-methylenebis[*N*-methyl-*o*-toluidine], add ammonium and sodium chlorides, heat the mixture in a current of ammonia at about 175°C, extract the dye with water at 80°C, and salt out (*GP* 67468)

Soluble in water (bright yellow), and decomposed on boiling
Soluble in ethanol (yellow)

H₂SO₄ conc. — colourless; on dilution — pale yellow

NOTES

TRIARYLMETHANE COLOURING MATTERS

The chromophore of this class is the quinonoid grouping, which may appear as $\overset{\curvearrowright}{\text{C}}=\text{Ar}=\text{NH}$ (as in Baeyer's fuchsonimine) or $\overset{\curvearrowright}{\text{C}}=\text{Ar}=\text{O}$ (as in Baeyer's fuchsone) (Ar =aromatic nucleus). Two aryl groups attached to the methane C-atom complete the chromogen, the dyes being formed by the introduction of two or three auxochromes, usually in *para*-position to the methane C-atom.

The introduction of a carboxyl group in *ortho*-position to a hydroxyl group confers mordant dyeing properties, while the introduction of sulfonic acid groups converts the basic dyes into acid dyes. When a sulfonic acid group is in *ortho*-position to the methane C-atom, the dye possesses enhanced fastness to alkali.

This class is one of the largest groups of synthetic dyes. It has been arranged according to constitution into six sub-groups, viz.

- (a) Diamino derivatives of Triphenylmethane (C.I.42000-42175)
- (b) Triamino derivatives of Triphenylmethane (C.I.42500-42800)
- (c) Aminohydroxy derivatives of Triphenylmethane (C.I.43500-43570)
- (d) Hydroxy derivatives of Triphenylmethane (C.I.43800-43875)
- (e) Derivatives of Diphenylnaphthylmethane (C.I.44000-44100)
- (f) Miscellaneous Triarylmethane derivatives (C.I.44500-44535)

Typical preparative methods are — (1) the condensation of benzaldehyde (or a substituted benzaldehyde) with arylamines or phenolic compounds, (2) the condensation of Michler's hydrol, or an analogue, with an arylamine or phenol (or naphthol) and (3) the condensation of Michler's ketone, or an analogue, with an amine in the presence of phosphorus oxychloride or thionyl chloride. The mechanism of formation of leuco-triarylmethane dyes by preparation (1) above is a two-step process, viz. (i) an aldol condensation between an aryl aldehyde and 1 mol. of an arylamine, and (ii) elimination of water between the aldol and a second mol. of an amine. The resulting leuco-compound is then oxidised to the dye which is isolated as a salt. In both preparations the amines used may be alike or different; the resulting combinations are very numerous.

Dyes of the triarylmethane class, usually reds, violets, blues or greens, are characterised by high tinctorial power and brilliant hue but generally possess only moderate fastness to light. The class includes basic, acid, direct, mordant, cosmetic and solvent dyes together with pigments of phosphomolybdotungstic acid lake type.

References

- Fierz-David, *Künstliche Organische Farbstoffe*, Julius Springer, Berlin, 1926
Tomioka, *JSCI* (Japan), **34** (1931), 176B-178B (cf. *JSDC*, **47** (1931), 238)
Schwarzenbach, *Helv. Chim. Acta*, **20** (1937), 490
Hammett, *Physical Organic Chemistry* (1940), 309 and 348
Davies and Hodgson, *JSDC*, **59** (1943), 196
Venkataraman, *The Chemistry of Synthetic Dyes*, Academic Press, New York, 1952
Lubs, *The Chemistry of Synthetic Dyes and Pigments*, Reinhold Publishing Corporation, New York, 1955
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TRIPHENYLMETHANE, DIPHENYLNAPHTHYLMETHANE, AND MISCELLANEOUS TRISUBSTITUTED METHANE COLOURING MATTERS

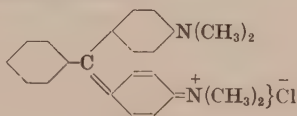
(a) Diamino derivatives of Triphenylmethane

42000 C.I. Basic Green 4 (*Bright bluish green*)

42000:1 (C.I. Solvent Green 1) is the free base

42000:2 (C.I. Pigment Green 4) is the phosphotungstomolybdic acid salt

Classical name **Malachite Green**



Oxalate — $2C_{23}H_{25}N_2 + 3C_2H_2O_4$

Zinc Double Chloride — $3C_{23}H_{25}N_2Cl_2 \cdot 2ZnCl_2 \cdot 2H_2O$

(a) Condense benzaldehyde (1 mol.) with *N,N*-dimethylaniline (2 mol.) in presence of hydrochloric or sulfuric acid, and oxidise the product with lead peroxide and acid

(b) Heat *N,N*-dimethylaniline with α,α -trichlorotoluene

Soluble in cold and hot water (blue green); very soluble in ethanol (blue green)

H_2SO_4 conc. — yellow; on dilution — dull orange

Aqueous solution + NaOH — greenish white ppt.

Discoverer — O. Fischer 1877

Agfa, *BP* 828/78; *USP* 222257; *FP* 123187; 144169; *GP* 4322, 18959, 23775, (*Fr.* 1, 40, 41, 43)

Bayer Co., *BP* 1976/78

M.L.B., *BP* 4762/79; *FP* 133704; *GP* 11412 (*Fr.* 1, 64)

Espenscheid, *GP* 14621 (*Fr.* 1, 68)

Badische Co., *BP* 4850/84, 5038/84; *FP* 160090; *GP* 27789 (*Fr.* 1, 80)

Wieland, *GP* 308298 (*Fr.* 13, 340)

Dicks, David, & Heller Co., *USP* 1483233

FIAT 1313, 2, 329

FIAT 764 — Malachitgruen BXN

O. Fischer, *Ber.* 10 (1877), 1625; 11 (1878), 950; 14 (1881), 2520; *Ann.* 206 (1881), 129

E. and O. Fischer, *Ber.* 11 (1878), 1081; 12 (1879), 791, 796, 2348

Doebner, *Ber.* 11 (1878), 1236, 2274; 12 (1879), 1010; 13 (1880), 2222; *Ann.* 217 (1883), 250

Lambrecht & Weil, *Ber.* 37 (1904), 3058; 38 (1905), 270

Schmidlin, *Compt. rend.* 139 (1904), 676

Nölting & Philipp, *Ber.* 42 (1908), 3910

Sidgwick & Moore, *JCS*, 95 (1909), 889

Wieland, *Ber.* 52 (1919), 880

Lowy & Haux, *Am. Electrochem. Soc.* 1921, 991

Kober, *Ind. Eng. Chem.* 15 (1923), 837

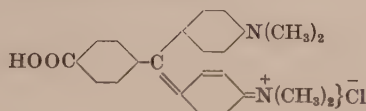
Chamberlain & Dull, *JACS*, 50 (1928), 3088

Tomioka, *JSCI, Japan*, 34 (1931), 176B

Dilthey, Brandt, Braun, & Schommer, *J. prakt. Chem.* 134 (1932), 188

Michaelis & Granick, *JACS*, 67 (1945), 1212

42005 C.I. Mordant Green 13



Condense 4,4'-bis(dimethylamino)benzhydrol with benzoic acid and oxidise the product with lead peroxide and acid

Discoverer — F. Runkel 1890

Bayer Co., *BP* 14621/90; *USP* 501104; *FP* 208330; *GP* 60606 (*Fr.* 3, 125)

FDX 885 — Chromgruen BD

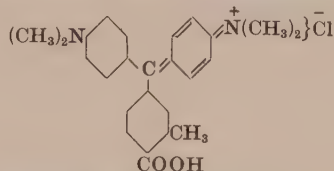
Soluble in water (greenish blue)

Soluble in ethanol (bluish green)

H_2SO_4 conc. — yellowish orange; on dilution — unaltered

Aqueous solution + NaOH — decolorised to faint blue

42010 C.I. Mordant Green 23 (*Bright green*)



Condense 4,4'-bis(dimethylamino)benzhydrol (1 mol.) with *o*-toluic acid (1 mol.) and oxidise the product with lead peroxide in acetic-hydrochloric acid

Discoverer — F. Runkel 1890

Bayer Co., *BP* 14621/90; *USP* 501104; *FP* 208330; *GP* 60606 (*Fr.* 3, 125)

FIAT 764 — Chromgruen GD ex.

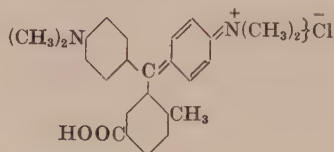
Soluble in water (turquoise blue)

Soluble in ethanol (green)

H_2SO_4 conc. — yellow to golden yellow; on dilution — golden yellow

Aqueous solution + NaOH — decolorised to light green

42015 C.I. Mordant Blue 52 (*Greenish blue*)



Condense 4,4'-bis(dimethylamino)benzhydrol with *p*-toluic acid, and oxidise the product with lead peroxide-hydrochloric acid

Discoverer — F. Runkel 1896

Bayer Co., *BP* 14621/90; *USP* 501104; *FP* 208330; *GP* 60606 (*Fr.* 3, 125), 90881 (*Fr.* 4, 211)

BIOS 1433, 131. *FIAT* 1313, 2, 366

FIAT 764 — Chromtuerkisblau B

Soluble in water (pure blue to turquoise blue)

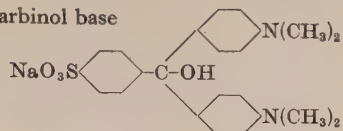
Soluble in ethanol (turquoise blue)

H_2SO_4 conc. — yellow to citron yellow; on dilution — moderate green

Aqueous solution + NaOH — decolorised to pale yellow brown

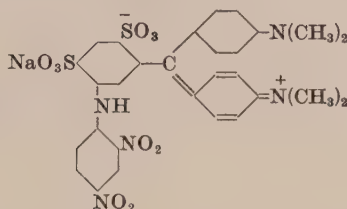
42020 Acid Dye

Carbinol base

(a) Sulfonate **Malachite Green (C.I.42000)**(b) Sulfonate leuco **Malachite Green**, oxidise the sulfonic acid formed, and convert into the sodium salt

Discoverers — Agfa 1878; Bindschedler and Busch 1879
 Agfa, *BP* 4406/78; *FP* 127298; *GP* 6714 (*Fr.* 1, 117)
 Bindschedler & Busch, *BP* 2509/79; *FP* 131325; *GP* 10410, 14944, (*Fr.* 1, 118, 118)
Chem. Ind. 3 (1880), 256

Soluble in water (blue green)
 Slightly soluble in ethanol
 H_2SO_4 conc. — yellow; on dilution — green
 Aqueous solution + NaOH — colourless

42021 Acid Dye (Bluish green)

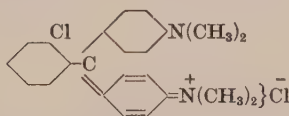
Preparation as for **C.I.42050** but with *N,N*-dimethyl- instead of *N,N*-diethylaniline

Discoverer — A. Hausdörfer 1905**Alkali Fast Green 3B (By)**

Dyes wool and silk in presence of sulfuric acid in bluish green shades

Fastness Properties (C): Light 3, Alkaline Milling 2-3, Perspiration 2-3, Washing 3

Patents as for **C.I.42050**

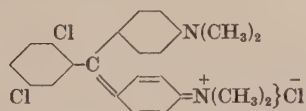
42025 C.I. Basic Blue 1 (Bright bluish green → Bright greenish blue)**42025:1 (C.I. Pigment Blue 9)** is the phosphotungstomolybdic acid salt

Condense *o*-chlorobenzaldehyde with *N,N*-dimethylaniline and oxidise the product with lead peroxide and acid

[Note — *m*- and *p*-chlorobenzaldehydes give dyes of no value]

Discoverers — Sandmeyer and Schmid 1896
 Geigy, *GP* 94126 (*Fr.* 4, 189)
BIOS 1088, 122; *BIOS* 1157, 53; *BIOS-MISC.* 20, Appendix 37;
FIAT 1313, 2, 333
FDX 885
FIAT 764 — Astrazonblau G, Rhodulinblau 6G
 Nölting & Philipp, *Ber.* 41 (1908), 3911
 Briggs, *JSDC*, 37 (1921), 291

Soluble in cold and hot water (green blue)
 Soluble in ethanol (green blue)
 H_2SO_4 conc. — red yellow; on dilution — yellow to green with yellow green ppt.
 Aqueous solution + NaOH — blue black ppt. changing to red brown

42030 Basic Dye

Condense 2,5-dichlorobenzaldehyde with *N,N*-dimethylaniline and oxidise the product

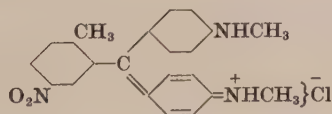
Discoverers — Bindschedler and Busch 1883**Victoria Green 3B (B)**

Bindschedler & Busch, *BP* 251511; *USP* 1588052; *FP* 603650;
Sw.P. 116995, addn. 118627/629; *GP* 25827 (*Fr.* 1, 42), 432427 (*Fr.* 15, 442)
FIAT 764 — Viktoriagrünbase

Slightly soluble in cold, readily soluble in hot water (green blue)
 H_2SO_4 conc. — yellow; on dilution — yellow green
 Aqueous solution + NaOH — reddish yellow solution with ppt.

42035 Basic Dye

Zinc double chloride of



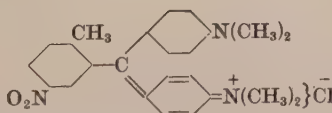
Oxidise **C.I.42036** with lead peroxide in acetic acid, whereby one or two methyl groups are removed, and isolate the dye as the zinc double chloride

Discoverers — F. Runkel and F. Reingruber 1891**Turquoise Blue BB (By)**

Bayer Co., *USP* 541572; *GP* 63743 (*Fr.* 3, 128)

42036 Basic Dye

Zinc double chloride of



Condense 4,4'-bis(dimethylamino)benzhydrol with *p*-nitrotoluene and oxidise the product

Discoverer — F. Runkel 1891**Turquoise Blue G (By)**

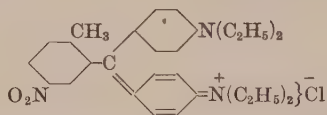
Bayer Co., *USP* 541572; *GP* 63743 (*Fr.* 3, 128)
FIAT 764 — Tuerkisblau G

Soluble in water (blue)
 Soluble in ethanol (greenish blue)
 H_2SO_4 conc. — golden yellow; on dilution — greenish yellow
 Aqueous solution + NaOH — brown to violet brown ppt.

42037

Basic Dye

Zinc double chloride of



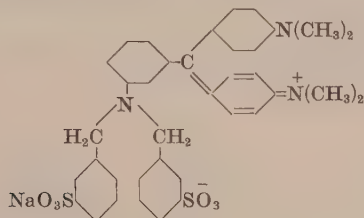
Condense 4,4'-bis(diethylamino)benzhydrol with *p*-nitrotoluene and oxidise the product

Turquoise Blue B (By)

Soluble in water (blue)

42038

C.I. Acid Green 11 (Bright bluish green)



Condense *m*-nitrobenzaldehyde with *N,N*-dimethylaniline, reduce the nitro group and dibenzylate, then disulfonate, oxidise, and convert the product to the sodium salt

Discoverer — H. Hassenkamp 1885

Bayer Co., BP 15337/85; FP 176847; GP 37067 (Fr. 1, 120)

FIAT 764 — Echtgruen blaueulich

JSDC, 6 (1890), 32; 9 (1893), 127

von Perger, Mitt. Gew. Mus. (1891), 202; cf. JSCI, 11 (1892), 30

Blangey, Fierz-David & Stamm, Helv. Chim. Acta, 25 (1942), 1162

Slightly soluble in cold, very soluble in hot water (bluish green)

Soluble in ethanol

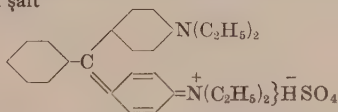
H₂SO₄ conc. — yellowish red; on dilution — colourless to greenish blue

Aqueous solution + NaOH — colourless on heating

42040

C.I. Basic Green 1 (Bright green)

42040:1 (C.I. Pigment Green 1) is the phosphotungstomolybdic acid salt



Condense benzaldehyde with *N,N*-diethylaniline in presence of hydrochloric or sulfuric acid, oxidise the product and convert to the sulfate. The resinous mixture first formed solidifies suddenly to a mass of well-defined crystals

Discoverers — Bindschedler and Busch 1879

FIAT 1313, 2, 328

Doebner, Ber. 13 (1880), 2229

O. Fischer, Ber. 14 (1881), 2521

Mühlhäuser, Dingl. 263 (1887), 260

Hannay, JSDC, 31 (1915), 248, 451

Fierz-David, Künstliche Organische Farbstoffe (1926), 229

Soluble in cold and hot water (green)

Very soluble in ethanol (green)

H₂SO₄ conc. — yellow; on dilution — green

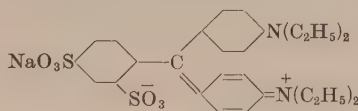
Aqueous solution + NaOH — pale green ppt.

42045

C.I. Acid Blue 1 (Bright greenish blue)

C.I. Food Blue 3 (Bright blue)

42045:1 is the aluminium salt, used in pharmaceuticals



Condense 4-formyl-*m*-benzenedisulfonic acid with *N,N*-diethylaniline, oxidise and convert the product into the sodium salt. Patent Blue VF Special is the free acid

Discoverer — Steiner 1902

Sandoz, BP 18255/02; USP 731139; FP 320621 and addns.;

GP 154528 (Fr. 7, 108)

BIOS 1433, 25, 28

FIAT 1313, 2, 352

FIAT 764 — Patentblau VF and neu

Holmes, Ind. Eng. Chem. 15 (1923), 833; cf. JSDC, 39 (1923), 354

Very soluble in cold and hot water (blue)

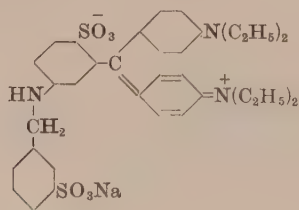
Soluble in ethanol (blue)

H₂SO₄ conc. — mustard yellow; on dilution — golden yellow

Aqueous solution + NaOH — blue; violet on boiling

42046

C.I. Acid Green 13 (Bluish green)



Condense *m*-nitrobenzaldehyde (1 mol.) with *N,N*-diethylaniline (2 mol.) in sulfuric acid, reduce, monobenzylate the amine formed, disulfonate with oleum, and oxidise with lead peroxide

Discoverer — H. Hassenkamp 1885

Fast Light Green (By)

Bayer Co., BP 15337/85; FP 176847; GP 37067 (Fr. 1, 120)

Blangey, Fierz-David & Stamm, Helv. Chim. Acta, 25 (1942), 1162

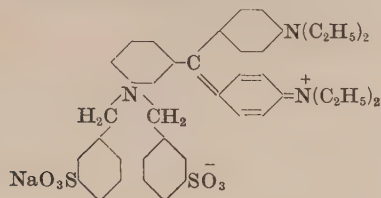
FIAT 764 — Echtlichtgruen

Very soluble in water (turquoise blue)

Soluble in ethanol (turquoise blue)

H₂SO₄ conc. — olive yellow; on dilution — medium green

Aqueous solution + NaOH — unchanged

42047 C.I. Acid Green 14 (Green)

Condense *m*-nitrobenzaldehyde (1 mol.) with *N,N*-diethylaniline (2 mol.), reduce, dibenzylate the amine formed, disulfonate, and oxidise the product with lead peroxide

Discoverer — H. Hassenkamp 1885

Fast Green CR (By)

Bayer Co., BP 15337/85; FP 176847; GP 37067 (*Fr.* 1, 120)

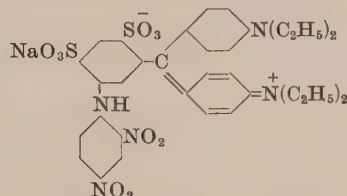
FIAT 764 — Echtgruen CR

Very soluble in water (bluish green)

Soluble in ethanol (blue green to turquoise blue)

H₂SO₄ conc. — yellow to citron yellow; on dilution — pale citron yellow

Aqueous solution + NaOH — pale blue green and ppt.

42050 C.I. Acid Green 8 (Bright green)

Condense *m*-nitrobenzaldehyde (1 mol.) with *N,N*-diethylaniline (2 mol.), reduce, condense the product with 1-chloro-2,4-dinitrobenzene, disulfonate with oleum, and oxidise with dichromate-oxalic acid

[3BX brand is a by-product and probably mainly a trisulfonic acid]

Discoverer — A. Hausdörfer 1905

Bayer Co., FP 193554; GP 63026, 66791, (*Fr.* 3, 154, 155)

FIAT 764 — Alkaliechtgruen 3BX, Alkaliechtgruen BBF

Very soluble in water (bluish green)

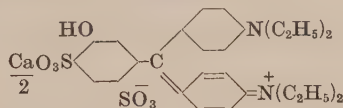
Very soluble in ethanol (bluish green)

H₂SO₄ conc. — pale citron yellow; on dilution — deeper citron yellow

Aqueous solution + NaOH — dirty blue green with ppt.

42051 C.I. Acid Blue 3 (Bright greenish blue)

C.I. Food Blue 5 (Bright blue)



(a) Condense *m*-nitrobenzaldehyde with *N,N*-diethylaniline (2 mol.), reduce, diazotise the amine formed, convert to the hydroxy compound, disulfonate, isolate as the calcium salt and oxidise

(b) Condense *m*-hydroxybenzaldehyde with *N,N*-diethylaniline (2 mol.), disulfonate, convert to calcium salt and oxidise

Discoverer — Hermann 1888

M.L.B., BP 12796/88, 14822/88; USP 412613, 412614, 412615;

FP 192743, 192807, 193554; GP 46384, 48523, 50286,

50293, 50440, 55621, (*Fr.* 2, 31, 39, 37, 41, 43, 44), 63026,

66791, 71156, 74014, (*Fr.* 3, 154, 155, 159, 160)

National Aniline, USP 1478015, 1509413

BIOS 1433, 25

FIAT 764 — Patentblau V

Knecht, JSDC, 5 (1889), 106

Lehne, Farben-Z. 1 (1890), 10

Sandmeyer, JSDC, 12 (1896), 154

E. and H. Erdmann, Ann. 294 (1897), 376

Sisley, Rev. gén. Mat. col. 6 (1902), 57

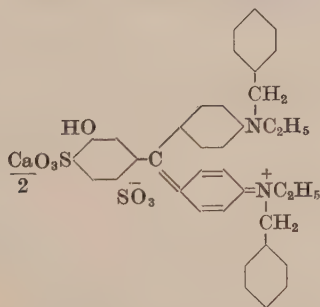
Holmes, Ind. Eng. Chem. 15 (1923), 354

H₂SO₄ conc. — brown-olive yellow; on dilution — deep yellow then green

Aqueous solution + NaOH — unaltered cold, deep violet hot

Very soluble in cold and hot water (blue)

Slightly soluble in ethanol (greenish blue)

42052 C.I. Acid Blue 5 (Bright greenish blue)

Condense *m*-hydroxybenzaldehyde with *N*-ethyl-*N*-phenylbenzylamine (2 mol.), disulfonate the product, oxidise, and isolate as the calcium salt

Discoverer — Hermann 1888

M.L.B., BP 12796/88, 14822/88; USP 422018; FP 192743;

GP 46384 (*Fr.* 2, 31)

See also patents under **C.I.42051**

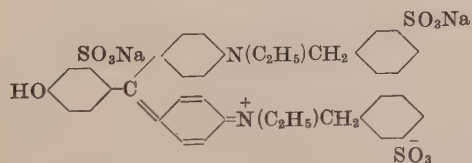
Holmes, Ind. Eng. Chem. 15 (1923), 833

Soluble in water (greenish blue)

Soluble in ethanol (bright green)

H₂SO₄ conc. — pale dull yellow; on dilution — blue green with ppt.

Aqueous solution + NaOH — unaltered cold, violet and ppt. hot

42053 C.I. Food Green 3 (Bluish green)

Condense *p*-hydroxybenzaldehyde with *N*-ethyl-*N*-phenylbenzylamine (2 mol.), trisulfonate the product, oxidise, and isolate as sodium salt

Discoverer — Warner-Jenkinson Manufacturing Co.

Ind. and Eng. Chem. 19 (1927), 497

Am. J. Pharm. Sept. 1942, p. 338

(See also Coal-tar Color Regulations, U.S. Food and Drug Administration, Sept. 1940, p. 5)

Very soluble in water (bluish green)

Soluble in ethanol (bluish green)

H₂SO₄ conc. — dull orange; on dilution — dull green

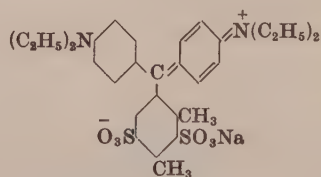
HCl conc. — orange

HNO₃ conc. — orange

10% aqueous NaOH — bright blue

42055 C.I. Acid Green 7 (*Bright bluish green*)
C.I. Solvent Green 15 (*Bright green*)

FIAT 764 — Guineaechtgruen B (50)



Condense 4,4'-bis(diethylamino)benzhydrol with 2,4-xylenesulfonic acid, sulfonate, and oxidise with dichromate

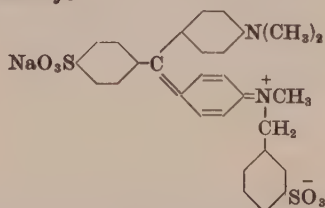
Very soluble in water
Soluble in ethanol

42060 Acid Dye

Discoverer — Bayer Co.

Acid Green BB extra (By)

Dyes wool in presence of sulfuric acid



Condense benzaldehyde with *N,N*-dimethylaniline (1 mol.) and *N*-methyl-*N*-phenylbenzylamine (1 mol.), sulfonate the product with oleum to the disulfonic acid, and oxidise with lead peroxide

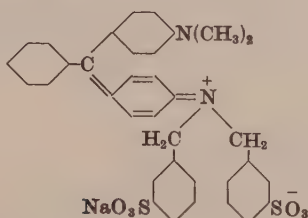
Very soluble in water (turquoise blue)
Slightly soluble in ethanol (blue green)
H₂SO₄ conc. — golden yellow; on dilution — pale yellow green
Aqueous solution + NaOH — decolorised

42065 Acid Dye

Discoverer — Bayer Co. 1883

Acid Green 6B (By)

Dyes wool in presence of sulfuric acid



Condense benzaldehyde (1 mol.) with *N,N*-dimethylaniline (1 mol.) and *N*-phenyldibenzylamine (1 mol.), disulfonate the product with oleum, and oxidise with dichromate-oxalic acid

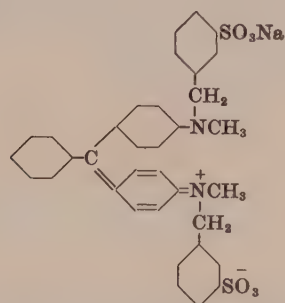
Very soluble in water (greenish blue)
Slightly soluble in ethanol (pale blue green)
H₂SO₄ conc. — yellow brown; on dilution — pale green
Aqueous solution + NaOH — decolorised to pale brown

42070 Acid Dye

Discoverer — Bayer Co.

Acid Green 3B (By)

Dyes wool in presence of sulfuric acid



Condense benzaldehyde (1 mol.) with α -(*N*-methylanilino)-*m*-toluenesulfonic acid (2 mol.), and oxidise the product with dichromate-oxalic acid

Discoverer — Köhler 1879

Light Green SF (Bluish) (IG)

FDX 885 — Lichtgruen SF bläul.

For an analogous preparation see:

FIAT 764 — Lichtgruen SF gelbl.

P. Mayer, *Zeit. Mikrosk.* 34 (1918), 317

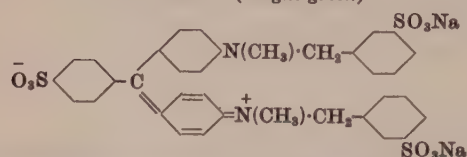
Very soluble in water (blue green)

Almost insoluble in ethanol (green)

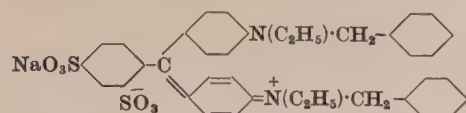
H₂SO₄ conc. — golden yellow; on dilution — green

Aqueous solution + NaOH — colourless with dull violet ppt.

42075 C.I. Acid Green 6 (*Bright green*)



Condense benzaldehyde with α -(*N*-methylanilino)-*m*-toluenesulfonic acid, sulfonate, oxidise the product, and convert to the sodium salt

42080 C.I. Acid Blue 7 (Bright greenish blue)

Condense 4-formyl-*m*-benzenedisulfonic acid with *N*-ethyl-*N*-phenylbenzylamine

Discoverer — Steiner 1902

Sandoz, BP 18255/02; USP 731139; FP 320621 and addns.;

GP 154528 (Fr. 7, 108)

BIOS 1433, 22

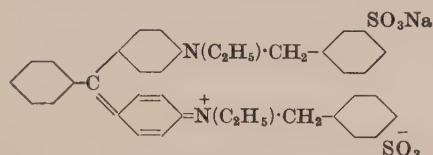
Holmes, *Ind. Eng. Chem.* **15** (1923), 833

Very soluble in cold and hot water (blue)

Soluble in ethanol (blue)

H₂SO₄ conc. — olive; on dilution — yellow

Aqueous solution + NaOH — blue turning to violet on boiling

**42085 C.I. Acid Green 3 (Bright green)
C.I. Food Green 1 (Bright bluish green)**

Condense benzaldehyde with α -(*N*-ethylanilino)-*m*-toluenesulfonic acid, oxidise the product, and convert to the sodium salt

Discoverers — Schultz and Streng 1883

Agfa, BP 7550/89; FP 198415; GP 50782 (Fr. 2, 47)

BIOS 1433, 136

FIAT 764 — Guineagruen B

Wales, *JACS*, **46** (1924), 2124

Soluble in water (green)

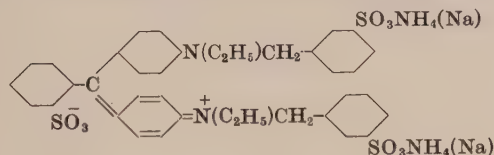
Soluble in ethanol (bluish green)

H₂SO₄ conc. — citron yellow; on dilution — green

Aqueous solution + NaOH — discolored (weakly brownish)

**42090 C.I. Acid Blue 9 (Bright greenish blue)
C.I. Food Blue 2 (Bright greenish blue)**

42090:1 (C.I. Pigment Blue 24) is the barium salt
42090:2 is the aluminium salt used in pharmaceuticals



Condense *o*-formylbenzenesulfonic acid with α -(*N*-ethylanilino)-*m*-toluenesulfonic acid, oxidise and convert the product formed into the ammonium or sodium salt

The sodium brands are obsolete

Discoverer — Sandmeyer 1896

Geigy, BP 5068/96; USP 564801; FP 254742; GP 89397 (Fr. 4, 184)

BIOS 1433, 20

FIAT 764 — Patentblau AE

Sandmeyer, *JSDC*, **12** (1896), 154; *Chem. Zeitsch.* **21** (1897), 535

Holmes, *Ind. Eng. Chem.* **15** (1923), 833; cf. *JSDC*, **39** (1923), 354

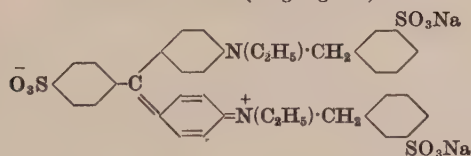
Knop, *Z. anal. Chem.* **77** (1929), 111; *Z. angew. Chem.* (1929), 894

Very soluble in water (greenish blue)

Soluble in ethanol

H₂SO₄ conc. — pale amber; on dilution — yellow changing to green and greenish blue

Aqueous solution + NaOH — violet on boiling

**42095 C.I. Acid Green 5 (Green)
C.I. Food Green 2 (Bright green)**

Condense benzaldehyde with *N*-ethyl-*N*-phenylbenzylamine, trisulfonate, oxidise the product and convert to the sodium salt

Discoverer — Köhler 1879

FIAT 764 — Saeuregruen kz. F extra stark (see PB 74025, fr. 1780-1 and PB 74711, fr. 8814)

Mühlhäuser, *Dingl.* **263** (1887), 250, 295

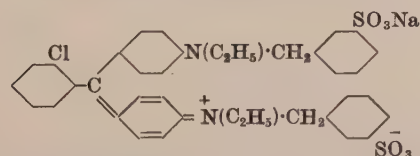
Friedländer, *Ber.* **22** (1889), 588

Very soluble in water (bluish green)

Almost insoluble in ethanol (green)

H₂SO₄ conc. — orange; on dilution — weak yellow

Aqueous solution + NaOH — almost colourless with dull violet ppt.

42100 C.I. Acid Green 9 (Bright bluish green)

Prepare as for C.I.42085 but with *o*-chlorobenzaldehyde as the aldehyde

Discoverer — Weiler-ter-Meer 1899

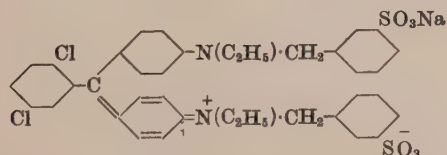
FIAT 764 — Neptungruen SGX

Very soluble in cold and hot water (green)

Soluble in ethanol (turquoise blue)

H₂SO₄ conc. — orange; on dilution — yellow

Aqueous solution + NaOH — olive green ppt. changing to dirty brown

42105 C.I. Acid Green 15 (Bright green)

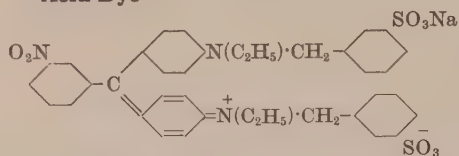
Condense 2,5-dichlorobenzaldehyde (1 mol.) with *N*-ethyl-*N*-phenylbenzylamine (2 mol.), disulfonate and oxidise

Discoverer — American Aniline Products Inc.

Very soluble in cold, very soluble in hot water (green)

H₂SO₄ conc. — orange brown; on dilution — yellow with yellow green ppt.

Aqueous solution + NaOH — yellower

42110 Acid Dye

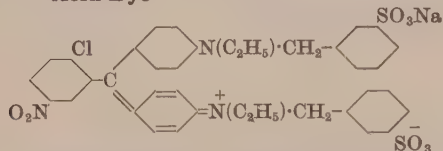
Discoverer — Agfa 1889

Guinea Green BV (A)

Dyes wool and silk in presence of acids
 Agfa, BP 7550/89; FP 198415; GP 50782 (*Fr.* 2, 47)

Soluble in water (yellow green)
 Soluble in ethanol (green)
 H₂SO₄ conc. — yellow; on dilution — yellow green

Condense *m*-nitrobenzaldehyde with α -(*N*-ethylanilino)-*m*-toluene-sulfonic acid, oxidise the product and convert to the sodium salt

42115 Acid Dye

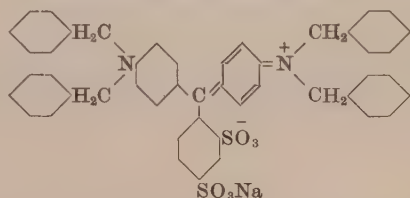
Discoverer — Weiler-ter-Meer 1899

Night Green B (tM)

Dyes wool and silk bluish green in presence of acid

Soluble in water (bluish green)
 Readily soluble in ethanol
 H₂SO₄ conc. — yellow; on dilution — yellow with green ppt.
 turning to bluish green
 Aqueous solution + NaOH — dull green ppt.

Prepare as for previous dye but with 2-chloro-5-nitrobenzaldehyde as the aldehyde

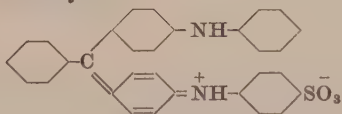
42120 C.I. Acid Blue 103 (Greenish blue)

Discoverer — I.G.

BIOS 1433, 41

FIAT 764 — Brillantindöblau 5G

Condense 4-formyl-*m*-benzenedisulfonic acid (1 mol.) with *N*-phenyldibenzylamine (2 mol.), and oxidise the product with dichromate-oxalic acid

42125 Acid Dye

Discoverer — Meldola 1877

Viridine (BSS), Alkali Green

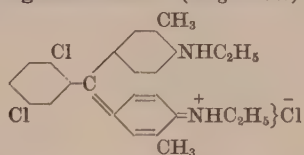
Dyes wool green in presence of acid

Ferrania, BP 961465

Meldola, *Ber.* 14 (1881), 1385; *JCS*, 41 (1882), 187Doebner, *Ber.* 15 (1882), 237

React benzotrichloride with diphenylamine, and then sulfonate the product

The pure dye is insoluble in water but dyes wool green from aqueous alkaline solution. The disulfonate is water soluble and dyes silk green. The commercial product probably contained the disulfonate.

42130 C.I. Pigment Blue 12 (Bright blue)*

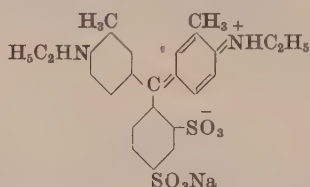
Discoverers — Schmid and Bachelut 1892

Ciba, BP 22741/93; USP 525627; FP 234576; GP 71370 (*Fr.* 3, 106), 77135 (*Fr.* 4, 190)

Condense 2,5-dichlorobenzaldehyde with *N*-ethyl-*o*-toluidine and oxidise the product

* Phosphotungstic acid salt

Soluble in hot water (greenish blue)
 Soluble in ethanol (blue)
 H₂SO₄ conc. — yellow; on dilution — green ppt.
 Aqueous solution + NaOH — yellowish orange ppt.

42135 C.I. Acid Blue 147 (Bright blue)

Discoverer — I.G.

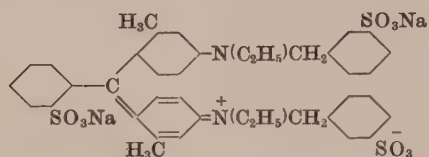
BIOS 1433, 42

FIAT 764 — Cyanol ex.

Prepare as for C.I. 42120 but with *N*-ethyl-*o*-toluidine instead of *N*-phenyldibenzylamine

Soluble in water (blue)

42165 Acid Dye



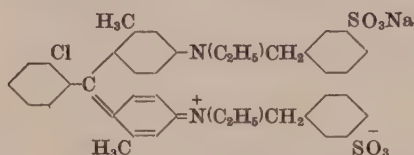
Condense *o*-formylbenzenesulfonic acid (1 mol.) with α -(*N*-ethyl-*m*-toluidino)-*m*-toluenesulfonic acid (2 mol.), and oxidise the product with lead peroxide in hydrochloric-acetic acid solution

Discoverer — Bayer Co.

Carbinol Fast Green G, GO (By)

Dyes wool in presence of sulfuric acid

42170 C.I. Acid Green 22 (Green)



Condense *o*-chlorobenzaldehyde (1 mol.) with α -(*N*-ethyl-*m*-toluidino)-*m*-toluenesulfonic acid (2 mol.), and oxidise the product with lead peroxide in sulfuric-acetic acid solution

Discoverer — M. Weiler 1912

Bayer Co., *BP* 19488/13; *USP* 1101770; *FP* 461810; *GP* 269214

(*Fr.* 11, 231)

FIAT 1313, 2, 351

FIAT 764 — Alkaliechtgruen 10G

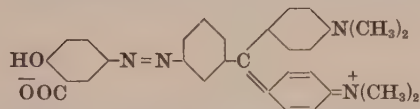
Very soluble in water (leaf green)

Very soluble in ethanol (leaf green)

H_2SO_4 conc. — brownish yellow; on dilution — golden yellow

Aqueous solution + NaOH — green ppt.

42175 Mordant Dye



Diazotise *N*',*N*',*N*'',*N*'''-tetramethyl-*m*,*p*',*p*''-methylidynetrianiline, couple with salicylic acid and oxidise the product in hydrochloric acid solution with lead peroxide

Discoverers — Sohst and Runkel 1888

Azo Green (By)

Dyes chromed wool yellowish green of good fastness to milling, but poor fastness to light. The chromium lake was used in wallpaper printing

Bayer Co., *BP* 3398/90; *FP* 204064; *GP* 57452 (*Fr.* 2, 51)

Slightly soluble in hot water (green)

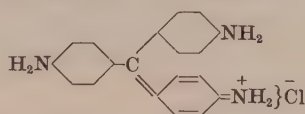
Slightly soluble in ethanol (green)

H_2SO_4 conc. — reddish brown; on dilution — reddish flocculent ppt.

(b) Triamino derivatives of Triphenylmethane

42500 C.I. Basic Red 9 (Bright bluish red)

Classical names **Para Magenta, Para Rosaniline**



(a) Heat *p*,*p*'-methylenedianiline with aniline, aniline hydrochloride, nitrobenzene, and ferric chloride at 170°C for several hours

(b) Heat aniline, *p*-toluidine, and their hydrochlorides with iron or ferrous chloride and nitrobenzene

(c) Oxidise a mixture of aniline and *p*-toluidine with arsenic acid

(d) Heat aniline with carbon tetrachloride

Slightly soluble in cold, more readily in hot water (red)

Readily soluble in ethanol (crimson)

H_2SO_4 conc. — yellow brown; on dilution — violet red

Discoverers — Coupier 1869; Rosenstiehl 1869; O. Fischer 1880; Greiff and Baum; Walter 1887; Homolka 1889; Monnet and Dury

M.L.B., *BP* 1212/81, 20678/89; *USP* 248154, 252202; *FP* 141077; *GP* 15120, 16750, 16766, 19304, 41929, (*Fr.* 1, 49, 57, 54, 49, 50), 105862 (*Fr.* 5, 192), 397823 (*Fr.* 14, 720)

Greiff, *GP* 15120, 19304, (*Fr.* 1, 49, 49)

Baum, *BP* 6000/86; *GP* 41929 (*Fr.* 1, 50)

FIAT 1313, 2, 330

Rosenstiehl, *Bull. Soc. ind. Mulhouse*, 36 (1866), 264; *Dingl.* 181 (1867), 389

Caro & Graebe, *Ber.* 11 (1878), 1117

E. and O. Fischer, *Ann.* 194 (1878), 242; *Ber.* 11 (1878), 1079; 13 (1880), 2204

Baeyer & Villiger, *Ber.* 37 (1904), 2857

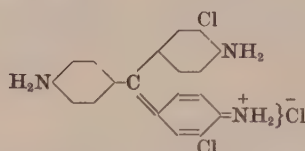
Hantzsch, *Ber.* 38 (1905), 2148

Lifschitz, *Ber.* 52 (1919), 1919

Wieland & Schening, *Ber.* 54 (1921), 2527

Holmes, *Ind. Eng. Chem.* 17 (1925), 59

42505 Basic Dye



Condense *p*-aminobenzaldehyde with *o*-chloroaniline and oxidise the product

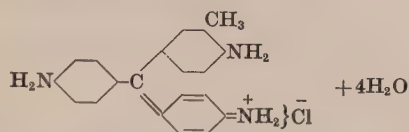
Discoverer — Cassella Co. 1912

Tryparosan

Cassella Co., *BP* 14742/12; *FP* 456498; *GP* 264942 (*Fr.* 11, 229)

Soluble in water (bluish red)

Soluble in ethanol (crimson)

42510 C.I. Basic Violet 14 (Reddish violet)**42510:1** (C.I. Solvent Red 41) is the free base**42510:2** (C.I. Pigment Violet 4) is the phosphotungstomolybdic acid saltClassical names **Magenta, Fuchsine**

(a) Heat a mixture of aniline, *o*(and *p*)-toluidine, and their hydrochlorides with nitrobenzene, or a mixture of nitrobenzene and *o*-nitrotoluene, in presence of iron and zinc chloride (nitrobenzene process)

(b) Heat a mixture of aniline and *o*(and *p*)-toluidine with arsenic acid (arsenic acid process)

H₂SO₄ conc. — yellow brown; on dilution — almost colourless
Aqueous solution + NaOH — almost colourless with red ppt.

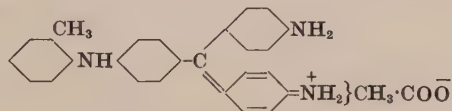
Discoverers — Natanson 1856; A. W. Hofmann 1858; Verguin 1858; Gerber and Keller 1859; Medlock 1860; Nicholson 1860; Girard and de Laire 1860; Laurent and Casthelaz 1861; Coupier 1869

Renard Frères & Franc, *FP* 46035 and 5 additionsGerber & Keller, *FP* 42621Medlock, *BP* 126/60; Nicholson, *BP* 184/60; Girard & de Laire, *BP* 1300/60; *FP* 44958Laurent & Casthelaz, *FP* 52223*FIAT* 1313, 2, 330Natanson, *Ann.* **98** (1856), 297A. W. Hofmann, *Jahresber.* **4** (1858), 353; *J. prakt. Chem.* **77** (1859), 190; **87** (1862), 226Coupier, *Jahresber.* **15** (1869), 568; *Ber.* **6** (1873), 25, 423, 1072Schmidlin, *Compt. rend.* **139** (1904), 676Lambrecht, *Ber.* **40** (1907), 247Wales & Nelson, *JACS*, **45** (1923), 1662Holmes, *Ind. Eng. Chem.* **17** (1925), 59Michaelis & Granick, *JACS*, **67** (1943), 1212

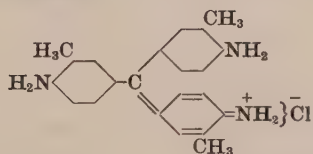
Soluble in cold and hot water (red violet)
Very soluble in ethanol (red)

42515 Basic Dye

A mixture of the acetate of *N*-phenyl- or *N*-*o*-tolylrosaniline with the corresponding derivatives of pararosaniline, obtained by heating the unchanged reactants from the magenta melt (arsenic acid process, C.I.42510) with acetic acid at about 120°C, e.g. acetate of *N*-*o*-tolyl-pararosaniline

*Discoverers* — Girard and de Laire 1860**Regina Purple (BSS) (WSS)**Girard & de Laire, *BP* 97/61; *FP* 45826

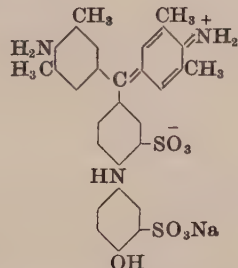
Soluble in water (red violet)
H₂SO₄ conc. — brown; on dilution — blue
Aqueous solution + NaOH — brown ppt.

42520 C.I. Basic Violet 2 (Dull reddish violet)Classical name **New Magenta**

Heat 4,4'-methylenedi-*o*-toluidine with *o*-toluidine and its hydrochloride in the presence of an oxidising agent

Discoverer — Homolka 1889M.L.B., *BP* 20678/89; *USP* 471638; *FP* 202769 and addn.; *GP* 59775 (*Fr.* **3**, 113), 87615 (*Fr.* **4**, 65), 397823 (*Fr.* **14**, 720)*FIAT* 764 — Neufuchsin 90 Plv.Lambrecht, *Ber.* **40** (1907), 247Holmes, *Ind. Eng. Chem.* **17** (1929), 59

Very soluble in water (red)
Very soluble in ethanol (red)
H₂SO₄ conc. — yellow to golden yellow; on dilution — pale citron yellow
Aqueous solution + NaOH — orange brown ppt.

42525 Acid Dye

Condense *p*-chlorobenzaldehyde (1 mol.) with 2,6-xylydine (2 mol.), sulfonate the product with oleum to the monosulfonic acid, air oxidise in pyridine solution in presence of copper salts, and condense with 4-amino-1-phenol-2-sulfonic acid

Discoverer — K. Schmidt 1929**Acid Violet RRL (By)**

Dyes wool in presence of sulfuric acid in level violet shades

Fastness Properties (C): Light 2, Milling 2, Perspiration 3, Sea water 3, Washing 2-3, 3, 3-4

Bayer Co., *BP* 299473; *USP* 1805925; 2199577; *FP* 662594, 845672; *GP* 492448 (*Fr.* **16**, 830), 699784 (*Fr.-Bayer*, I-2, 1101)*FIAT* 764 — Saeureviolett RRL

Soluble in water (red violet)
Soluble in ethanol (red violet)
H₂SO₄ conc. — wine red; on dilution — violet
Aqueous solution + NaOH — decolorised to pale red violet grey

42530 Basic Dye

A mixture of methylated or ethylated rosaniline (C.I.42510) and pararosaniline (C.I.42500) of varying composition, obtained originally by heating the above dyes with methyl or ethyl iodide in methyl alcohol

Discoverers — A. W. Hofmann and Geyger 1863**Hofmann's Violet (BSS)**A. W. Hofmann & Geyger, *BP* 1291/63; *FP* 59309A. W. Hofmann, *Compt. rend.* **54** (1862), 428; **56** (1863), 945; **57** (1863), 30; *Jahresber.* (1862), 347; *Dingl.* **172** (1864), 306Related to *FDX* 885 — Rotviolett 5R ex. and Rotviolett 5RB

H₂SO₄ conc. — brownish yellow; on dilution — blue
Aqueous solution + NaOH — brownish red ppt.

Soluble in water (bluish violet)
Insoluble in ethanol

- 42535** C.I. Basic Violet 1 (*Bluish violet*)
42535:1 (C.I. Solvent Violet 8) is the free base
42535:2 (C.I. Pigment Violet 3) is the phosphotungstomolybdic acid salt
42535:3 (C.I. Pigment Violet 27) is the copper ferrocyanide complex

Classical name Methyl Violet

A mixture of the hydrochlorides of the more highly methylated pararosanilines, containing principally the *N*-tetra-, penta-, and hexamethyl derivatives, obtained by oxidation of *N,N*-dimethylaniline with cupric chloride, or by the action of air on an intimate mixture of *N,N*-dimethylaniline, phenol, sodium chloride, and copper sulfate

Soluble in cold and hot water (violet)
 Very soluble in ethanol (violet)
 H₂SO₄ conc. — orange; on dilution — green ppt.
 Aqueous solution + NaOH — brown red and ppt.

Discoverer — Lauth 1861. Placed on the market by Poirrier and Chappat 1866

Lauth, *BP* 3195/66; *FP* 71970
FIAT 1313, 2, 314
FIAT 764 — Methylviolettbase
 Lauth, *Mon. sci.* (1861), 336; (1866), 1033
 A. W. Hofmann, *Ber.* 6 (1873), 352
 E. and O. Fischer, *Ber.* 11 (1878), 2098; 12 (1879), 2350; *Ann.* 194 (1878), 295
 Crossley, *JACS*, 41 (1919), 2084
 Briggs, *JSDC*, 37 (1921), 291
 Kober, *Ind. Eng. Chem.* 15 (1923), 837
 Holmes, *Ind. Eng. Chem.* 17 (1925), 918
Fanal Violet RM (IG)

Pigment for printing inks, consisting of the copper ferrocyanide lake of C.I.42535

M. Michels, *BP* 407856; *GP* 657740 (*Fr.* 24, 607)
BIOS 961, 29. *BIOS* 1661, 19
FIAT 764 — Fanalviolett RM Plv.

42536 C.I. Basic Violet 13 (*Bluish violet*)

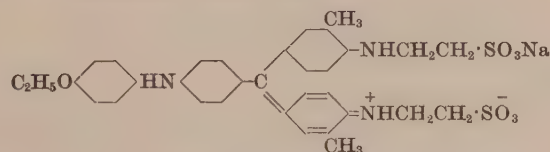
A mixture of the hydrochlorides of benzylated tetra- and penta-methylpararosaniline with the hydrochloride of hexamethylpararosaniline obtained by reacting benzyl chloride with an alkaline ethanolic solution of Methyl Violet (C.I.42535)

Discoverer — Lauth 1866

Lauth & Grimaux, *Bull. Soc. chim.* 7 (1867), 105
 O. Fischer & Körner, *Ber.* 16 (1883), 2910
 Mühlhäuser, *Dingl.* 270 (1888), 179

Soluble in water (blue violet)
 Soluble in ethanol (blue violet)
 H₂SO₄ conc. — yellow; on dilution — violet
 Aqueous solution + NaOH — brown red ppt.

42540 Acid Dye (*Bluish violet*)



Condense *N*-*o*-tolyltaurine (2 mol.) with *p*-chlorobenzaldehyde (1 mol.), oxidise the product with dichromate-oxalic acid, and fuse with *p*-phenetidine

Discoverer — I.G. 1931

Acid Violet 5BL (IG)

Dyes wool in presence of sulfuric acid

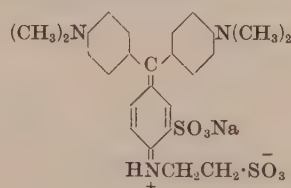
Fastness Properties (C): Light 3, Alkaline Milling 3, Perspiration 3, Washing 3-4

I.G., *BP* 387956, 420307, 421592, 430499; *USP* 1921334, 2003407; *FP* 742756, 44375/742756; *GP* 574021 (*Fr.* 19, 1574), 590748 (*Fr.* 20, 1040), 597078, 606248, (*Fr.* 21, 794, 792)

FIAT 764 — Saeureviolett 5BL

Slightly soluble in water (violet)
 Soluble in ethanol (violet)
 H₂SO₄ conc. — orange brown; on dilution — violet

42545 Acid Dye (*Bright violet*)



Condense 4,4'-bis(dimethylamino)benzhydrol with *o*-(2-sulfoethyl-amino)benzenesulfonic acid, and oxidise the product with chloranil or manganese dioxide in acetic acid

Discoverer — I.G. 1931

Acid Violet BWN (IG)

Dyes wool in presence of sulfuric acid in bright violet shades

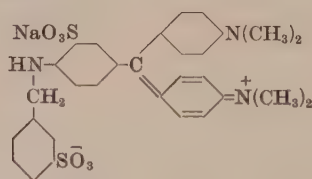
Fastness Properties (C): Light 2, Alkaline Milling 3, Perspiration 2-3, Washing 3

I.G., *BP* 387956, 420307, 421592, 430499; *USP* 1921334, 2003407; *FP* 742756, 44375/742746; *GP* 574021 (*Fr.* 19, 1574), 590748 (*Fr.* 20, 1040), 597078, 606248, (*Fr.* 21, 794, 792)

FIAT 764 — Saeureviolett BWN

Soluble in water (violet)
 Soluble in ethanol (violet)
 H₂SO₄ conc. — golden orange; on dilution — violet
 Aqueous solution + NaOH — almost decolorised to red orange

42550 Acid Dye



Sulfonate *o*-benzylaminobenzenesulfonic acid with oleum, condense the product with 4,4'-bis(dimethylamino)benzhydrol, and oxidise with lead peroxide in acetic acid

Discoverer — A. Hausdörfer 1902

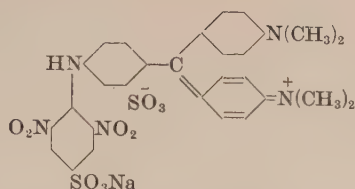
Acid Violet BW (By)

Dyes wool in presence of sulfuric acid in violet shades of poor light fastness

BIOS 1433, 119
FIAT 764 — Saeureviolett BW

Soluble in water (violet)
 Slightly soluble in ethanol (violet)
 H₂SO₄ conc. — golden yellow to brown orange; on dilution — pale violet
 Aqueous solution + NaOH — decolorised

42551 Acid Dye



Condense 4,4'-bis(dimethylamino)benzhydrol with the condensation product of 4-chloro-3,5-dinitrobenzenesulfonic acid and metanilic acid, oxidise, and convert to the sodium salt

Discoverer — Julius 1906

Agalma Green B (B)

Dyes wool and silk in presence of acid in level greenish shades of good fastness to alkali, milling and washing, rendered faster by afterchroming

Badische Co., *BP* 25977/06, 5640/07; *USP* 886815; *FP* 371742; *GP* 186989 (*Fr.* 9, 196)

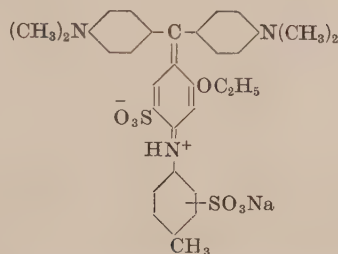
Soluble in water (green)

Soluble in hot ethanol (green)

H₂SO₄ conc. — dull yellow; on dilution — yellowish brown

Aqueous solution + NaOH — blue

42552 Acid Dye



Condense 4,4'-bis(dimethylamino)benzophenone with *N*-*p*-tolyl-*m*-phenetidine in toluene solution with phosphorus oxychloride, and sulfonate with 65% oleum

Discoverer — I.G.

Acid Violet 2B (IG), Acid Violet 6BNOO (IG)

Dyes wool and silk in presence of acid violet blue of moderate fastness to light and washing

BIOS 959, 13; 1433, 53

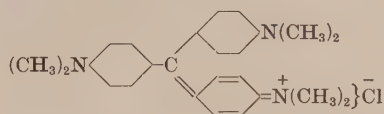
FIAT 764 — Saeureviolett 6BNOO

42555 C.I. Basic Violet 3 (Bright bluish violet)

42555:1 (C.I. Solvent Violet 9) is the free base

42555:2 (C.I. Pigment Violet 39) is the PMA salt

Classical name **Crystal Violet**



(a) Condense 4,4'-bis(dimethylamino)benzophenone with *N,N*-dimethylaniline and phosphorus trichloride

(b) React *N,N*-dimethylaniline with phosgene in the presence of zinc chloride

(c) Condense 4,4'-bis(dimethylamino)benzhydrol with *N,N*-dimethylaniline and oxidise the product

Discoverers — Kern and Caro 1883

Badische Co., *BP* 4428/83, 5450/83, 4850/84, 11030/84, 12022/86; *USP* 290856, 290891, 290892; *FP* 157430, 158438, 160090, 213928; *GP* 26016, 27032, 27789, 29943, 29962, (*Fr.* 1, 78, 75, 80, 70, 86)

M.L.B., *BP* 4961/84; *GP* 34463 (*Fr.* 1, 88)

S. A. St. Denis, *GP* 61815 (*Fr.* 3, 101)

Kern & Sandoz, *GP* 64270 (*Fr.* 3, 140)

Heumann, *BP* 8634/92; *GP* 66511 (*Fr.* 3, 102)

Wieland, *GP* 308298 (*Fr.* 13, 340)

BIOS 959, 9. *FIAT* 1313, 2, 317–320

FIAT 764 — Kristallviolett Plv., and 10B

O. Fischer & German, *Ber.* 16 (1883), 706

O. Fischer & Körner, *Ber.* 16 (1883), 1904; 17 (1884), 98

A. W. Hofmann, *Ber.* 18 (1885), 767

Schmidlin, *Compt. rend.* 139 (1904), 676

Lambrecht & Weil, *Ber.* 37 (1904), 3058

Nölting & Philipp, *Ber.* 41 (1908), 3909

Karrer, *Ber.* 50 (1917), 1497

Wieland, *Ber.* 52 (1919), 880

Lifschitz, *Ber.* 52 (1919), 1919

Wales & Nelson, *JACS*, 45 (1923), 1661

Soluble in cold and hot water (violet)

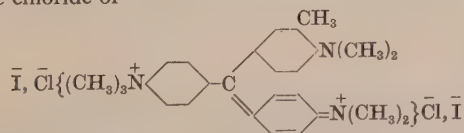
Very soluble in ethanol (violet)

H₂SO₄ conc. — red yellow; on dilution — dull greenish yellow changing to blue and violet

Aqueous solution + NaOH — violet ppt.

42556 Basic Dye

Zinc double chloride of



React methyl iodide or chloride with Rosaniline (C.I.42510) or with Hofmann's Violet (C.I.42530)

Discoverer — Keisser 1866

Iodine Green

Keisser, *FP* 71625

A. W. Hofmann & Girard, *Ber.* 2 (1869), 442

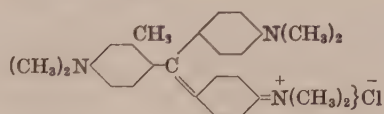
Appenzeller, *Ber.* 6 (1873), 965

Soluble in water (bluish green)

H₂SO₄ conc. — reddish yellow; on dilution — pale yellowish-green

Aqueous solution + NaOH — colourless

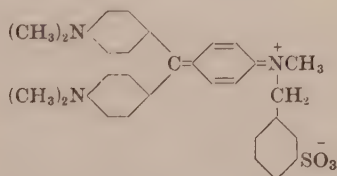
42557 C.I. Basic Violet 23



(a) Condense 4,4'-bis(dimethylamino)benzophenone with *N,N*-dimethyl-*m*-toluidine and phosphorus trichloride

(b) Condense 4,4'-bis(dimethylamino)benzhydrol with *N,N*-dimethyl-*m*-toluidine and oxidise the product

42560 C.I. Acid Violet 16 (Bluish violet)



Condense 4,4'-bis(dimethylamino)benzhydrol with α -(*N*-methyl-anilino)-*m*-toluenesulfonic acid, and oxidise the product with lead peroxide-hydrochloric acid

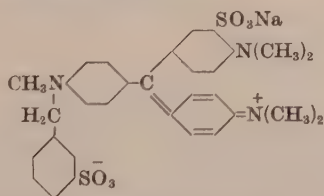
Discoverer — H. Hassenkamp 1891

Alkali Violet R (By)

Bayer Co., BP 19062/91; USP 498471; FP 217020; GP 69654 (Fr. 3, 133)

FIAT 764 — Alkaliviolet R

42561 C.I. Acid Blue 34 (Bright blue)



Condense 4,4'-bis(dimethylamino)benzophenone with *N*-methyl-*N*-phenylbenzylamine and phosphorus oxychloride, then disulfonate, and convert to sodium salt

Discoverers — Schmalzigang 1883; Hassenkamp 1883

Badische Co., BP 4850/84, 5038/84; FP 160090; GP 27789 (Fr. 1, 80)

Bayer Co., BP 7645/84; USP 331964, 331965; FP 161967; GP 31509 (Fr. 1, 113)

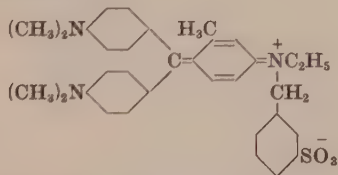
Very soluble in cold and hot water (blue violet)

Slightly soluble in ethanol

H₂SO₄ conc. — yellow; on dilution — olive to green

Aqueous solution + NaOH — blue flocculent ppt.

42562 Acid Dye



Condense 4,4'-bis(dimethylamino)benzhydrol with α -(*N*-ethyl-*m*-toluidino)-*m*-toluenesulfonic acid, and oxidise the product with lead peroxide-hydrochloric acid

Discoverer — A. Hausdörfer 1911

Alkali Violet 10B (By)

Dyes wool and silk from an acid or neutral bath violet shades

Fastness Properties (C): Alkali 4, Light 1, Milling 3, Perspiration 3, Sea water 2, Washing 3

42563 C.I. Basic Blue 8 (Reddish blue)

42563:1 (C.I. Solvent Blue 2) is the free base



The constitution for this dye given in BIOS 1433, 72 is incorrect; this error led to the inclusion of this Diphenylnaphthylmethane dye with the Triphenylmethanes

React *N*-methyl-*N*-phenyl-1-naphthylamine with *p,p'*-(dichloromethylene)bis[*N,N*-dimethylaniline]

Discoverers — Caro and Kern 1883

Badische Co., BP 5038/84, 11159/84, 12022/86; USP 308748; FP 160090; GP 27032, 27789, 29962, (Fr. 1, 75, 80, 86)

BIOS 959, 16

FIAT 764 — Viktoriablauf 4R

Nathansohn & Müller, Ber. 22 (1889), 1891

Venkataraman (1952), 721

Lubs (1955), 286

Soluble in cold, very soluble in hot water (blue)

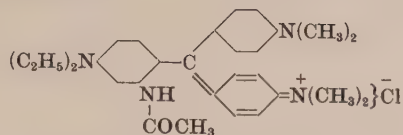
Very soluble in ethanol (blue)

H₂SO₄ conc. — yellowish brown; on dilution — green and then yellowish brown

Aqueous solution + NaOH — violet brown ppt.

42565 Basic Dye

Zinc double chloride of



Condense 4,4'-bis(dimethylamino)benzhydrol with *m*-diethylamino-acetanilide in acetic-sulfuric acid, oxidise with lead peroxide in acetic-hydrochloric acid, and isolate as the zinc double chloride

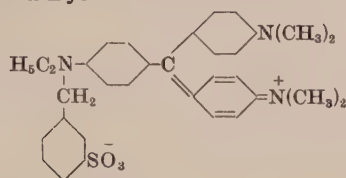
Discoverers — O. Nastvogel and R. Kothe

Brilliant Rhoduline Blue R (By)

Bayer Co., BP 5056/94, 5711/94; FP 239031; GP 81374, 82268, (Fr. 4, 204, 205)

BIOS 1433, 127

FIAT 764 — Brillantrhodulinblau R

42570 Acid Dye

Condense 4,4'-bis(dimethylamino)benzhydrol with α -(*N*-ethyl-anilino)-*m*-toluenesulfonic acid, and oxidise the product with lead peroxide in hydrochloric-acetic acid

Discoverer — F. Reingruber 1896

Acid Violet 8B extra (By)

Dyes wool in presence of sulfuric acid

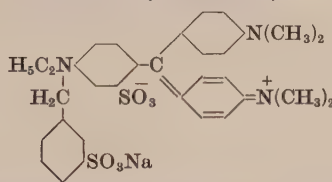
Bayer Co., BP 14728/92; USP 501069; FP 217020; GP 68865 (Fr. 3, 132)

Soluble in water (violet)

Soluble in ethanol (violet)

H₂SO₄ conc. — golden yellow; on dilution — yellow green

Aqueous solution + NaOH — pale violet

42571 C.I. Acid Blue 13 (Reddish blue)

React 4,4'-bis(dimethylamino)benzhydrol with *N*-ethyl-*N*-(*m*-sulfo-benzyl)metanilic acid, oxidise, and convert to the sodium salt

Note — **Echtsaeureviolett 10B** is a mixture of the disulfonated dye and a small amount of **C.I.42570**

Discoverer — H. Hassenkamp 1891

Bayer Co., BP 19062/92; USP 501069, 611628; FP 217020; GP 68291, 69777, (Fr. 3, 130, 39)

FIAT 1313, 2, 348

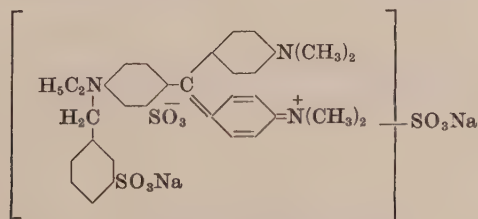
FIAT 764 — Echtsaeureviolett 10B

Very soluble in cold and hot water (violet)

Slightly soluble in ethanol (violet)

H₂SO₄ conc. — reddish yellow; on dilution — greenish yellow

Aqueous solution + NaOH — pink on heating

42572 Acid DyeSulfonate **C.I.42571** and convert to the sodium salt

Discoverer — Geigy

Alpine Blue (Gy)

Dyes wool in presence of acids in level violet blue shades of poor fastness to light and good fastness to alkali

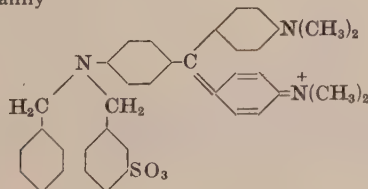
Geigy, FP 211913; GP 65017 (Fr. 3, 116)

Soluble in water (blue)

Soluble in ethanol (blue)

H₂SO₄ conc. — brown yellow; on dilution — green**42575 Acid Dye**

Mainly



(Contains some disulfonic acid)

Condense 4,4'-bis(dimethylamino)benzhydrol with α -(*N*-benzyl-anilino)-*m*-toluenesulfonic acid, and oxidise the product with manganese dioxide or lead peroxide in acetic acid

Discoverer — H. Hassenkamp 1891

Acid Violet 4BL (By)

Dyes wool from a sulfuric acid and silk from an acetic acid or neutral dyebath in violet shades, levelling moderate

Fastness Properties (C): Alkali 4-5, Light 1, Milling 2-3, Perspiration 3-4, Sea water 3, Washing 3

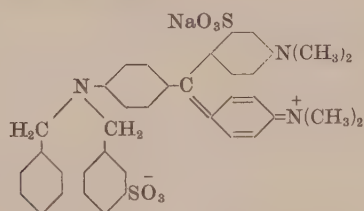
Bayer Co., BP 19062/91; USP 498471; FP 217020; GP 69654 (Fr. 3, 133)

Soluble in water (violet)

Soluble in ethanol (violet)

H₂SO₄ conc. — golden yellow to golden orange; on dilution — pale turquoise blue

Aqueous solution + NaOH — pale cornflower blue

42576 C.I. Acid Blue 75 (Violet blue)

Condense 5-dimethylamino- α -(*p*-dimethylaminophenyl)- α -hydroxy-*o*-toluenesulfonic acid (2-sulfo-Michler's hydrol) with α -(*N*-benzyl-anilino)-*m*-toluenesulfonic acid, oxidise the product and convert to the sodium salt

Discoverer — Geigy 1895

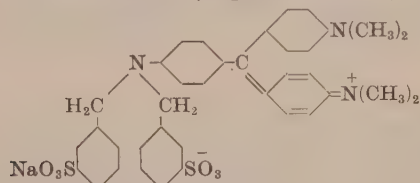
Geigy, *GP* 88085 (*Fr.* 4, 219)

Blangey, Fierz-David & Stamm, *Helv. Chim. Acta*, **25** (1942), 1162

Soluble in water (violet)

Soluble in ethanol (violet)

H₂SO₄ conc. — light brown; on dilution — pale green to blue

42580 C.I. Acid Violet 21 (Bright reddish violet)

Condense 4,4'-bis(dimethylamino)benzhydrol with α,α' -(phenyl-imino)di-*m*-toluenesulfonic acid, and oxidise the product with manganese dioxide or lead peroxide in acetic acid

Discoverer — H. Hassenkamp 1891

Bayer Co., *BP* 19062/91; *USP* 498471; *FP* 217020; *GP* 69654 (*Fr.* 3, 133)

FIAT 1313, 2, 346

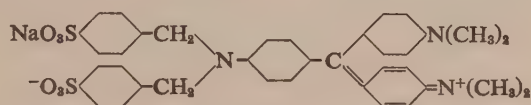
FIAT 764 — Saeureviolett 4BL

Soluble in water (violet)

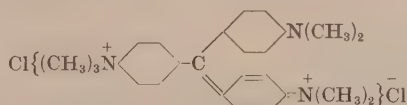
Soluble in ethanol (violet)

H₂SO₄ conc. — golden yellow; on dilution — pale blue green

Aqueous solution + NaOH — pale blue

42581 C.I. Food Violet 3**42585 C.I. Basic Blue 20 (Greenish blue)**

Zinc double chloride of



React methyl chloride with **Methyl Violet (C.I.42535)**

Discoverers — Lauth and Baubigny 1871; Wischin, 1873; Monnet and Reverdin 1874

BIOS 959, 9

Lauth & Baubigny, *Ber.* **6** (1873), 825

Monnet & Reverdin, *Mon. sci.* (1878), 124

A. W. Hofmann, *Ber.* **6** (1873), 363

E. and O. Fischer, *Ber.* **12** (1879), 2351

Soluble in water (blue green)

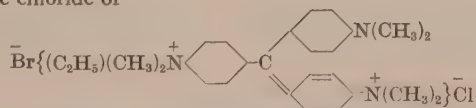
Insoluble in ethanol and amyl alcohol

H₂SO₄ conc. — reddish yellow; on dilution — yellowish green

Aqueous solution + NaOH — colourless

42590 Basic Dye

Zinc double chloride of



React ethyl bromide with **Methyl Violet (C.I.42535)**

Discoverer — Holliday 1866

Methyl Green (St.D), (A), (By), (tM)

Read Holliday & Sons, *BP* 1340/66

Soluble in water (greenish blue)

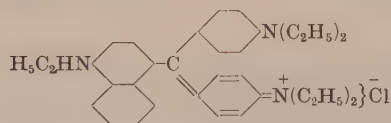
H₂SO₄ conc. — yellow; on dilution — green

Aqueous solution + NaOH — colourless with orange brown ppt.

42595 C.I. Basic Blue 7 (Bright reddish blue)

42595:1 (C.I. Solvent Blue 5) is the free base

42595:2 (C.I. Pigment Blue 1) is the phosphotungstomolybdic acid salt



Condense 4,4'-bis(diethylamino)benzophenone with *N*-ethyl-1-naphthylamine in toluene with phosphorus oxychloride

Discoverer — Bayer Co. 1893

Bayer Co., *BP* 23392/93

BIOS 959, 16. *FIAT* 1313, 2, 326; 3, 539

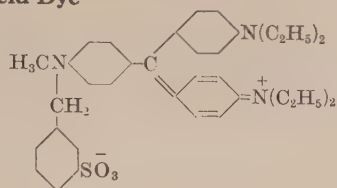
FIAT 764 — Viktoriarenblau BO

Slightly soluble in cold, soluble in hot water (blue)

Very soluble in ethanol (blue)

H₂SO₄ conc. — brownish yellow; on dilution — reddish yellow

Aqueous solution + NaOH — red brown

42596 Acid Dye

Condense 4,4'-bis(diethylamino)benzophenone with *N*-methyl-*N*-phenylbenzylamine and phosphorus oxychloride, and sulfonate with 30% oleum

Discoverer — Badische Co.

Alkali Violet 4BNOO (B)

Dyes wool in presence of sulfuric acid violet shades of poor light and moderate alkali fastness

BIOS 959, 1

42600 C.I. Basic Violet 4 (Bluish violet)

42600:1 (C.I. Pigment Blue 14) is the phosphotungstomolybdic acid salt



Preparation as for C.I.42555 with *N,N*-diethyl- instead of *N,N*-dimethylaniline

Fanal Blue RM (IG) is the copper ferrocyanide lake

Discoverers — Kern 1883; Caro 1883

Ethyl Violet

Badische Co., BP 4428/83, 5450/83, 5038/84, 11030/84, 8634/92; USP 290856, 290891, 290892, 290893, 327953; FP 158438, 160090; GP 26016, 27032, 27789, 29943, 29962, (Fr. 1, 78, 75, 80, 79, 86), 66511 (Fr. 3, 102)

S.A. St. Denis, GP 61815 (Fr. 3, 101)

BIOS 959, 7, No. 28. FIAT 1313, 2, 319

FIAT 764 — Aethylviolett BOO

Holmes, Ind. Eng. Chem. 17 (1925), 918

Fanal Blue RM (IG)

Bright blue pigment, chiefly used in printing inks

M. Michels, BP 407856; FP 889442; GP 657740 (Fr. 24, 607)

BIOS 961, 29. BIOS 1661, 19. FIAT 1313, 3, 553

FIAT 764 — Fanalblau RM Plv.

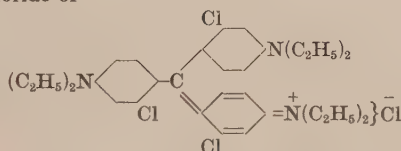
Soluble in cold and hot water (violet blue)

Very soluble in ethanol (blue violet)

H₂SO₄ conc. — orange; on dilution — yellow orange to green
Aqueous solution + NaOH — grey violet ppt.

42605 Acid Dye

Zinc double chloride of



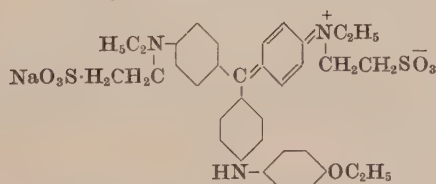
Condense 2-chloro-4-diethylaminobenzaldehyde (1 mol.) with *m*-chloro-*N,N*-diethylaniline (2 mol.), oxidise in nitric acid with lead peroxide, and isolate as zinc double chloride

Discoverer — Agfa 1896

Brilliant Silk Blue 10B (A), (By)

Dyes wool and silk bright blue shades in presence of acids, of poor fastness to light and washing

Geigy, BP 27372/03; GP 90771 (Fr. 4, 194), Pat. addn. 13106 (Fr. 5, 212) refused

42610 Acid Dye

Condense *p*-chlorobenzaldehyde (1 mol.) with *N*-ethyl-*N*-phenyl-taurine (2 mol.), oxidise with dichromate-oxalic acid, and fuse with *p*-phenetidine

Discoverer — I.G. 1931

Brilliant Wool Blue FFRL (IG)

Dyes wool from an acetic acid dyebath in bright blue shades of poor fastness to light and moderate fastness to washing

I.G., BP 387956, 420307, 421592, 430499; USP 1921334, 2003407; FP 742756; GP 574021 (Fr. 19, 1574), 590748 (Fr. 20, 1040), 597078, 606248, (Fr. 21, 794, 792)

BIOS-MISC 20, App. No. 27

FIAT 764 — Brillantwoollblau FFRL

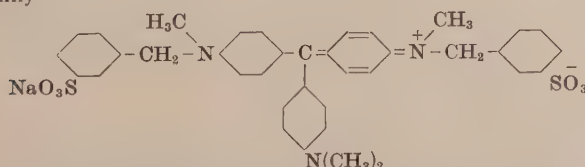
Very soluble in water (blue violet)

Soluble in ethanol (pure blue)

H₂SO₄ conc. — red orange brown; on dilution — turquoise blue

42615 Acid Dye

Mainly



Condense formaldehyde with α -(*N*-methylanilino)-*m*-toluenesulfonic acid, and air oxidise the product formed with an excess of *N,N*-dimethylaniline in the presence of copper salts

Discoverer — Bayer Co. 1896

Acid Violet 4BN extra (By)

Dyes wool in presence of sulfuric acid

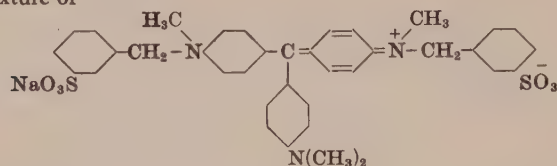
Soluble in water (violet blue to blue violet)

Slightly soluble in ethanol (pure blue)

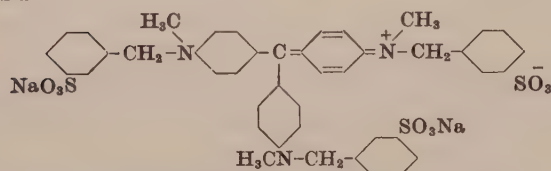
H₂SO₄ conc. — orange brown; on dilution — grey blue

42620 Acid Dye

Mixture of



and



Condense formaldehyde with α -(*N*-methylanilino)-*m*-toluenesulfonic acid, and air oxidise the products formed with a deficiency of *N,N*-dimethylaniline in the presence of copper salts

Discoverer — Bayer Co. 1896

Acid Violet 3BN extra (By)

Dyes wool from a sulfuric acid and silk from an acetic acid or neutral dyebath, levelling moderate

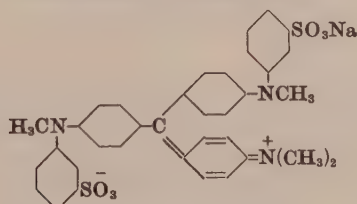
Fastness Properties (C): Alkali 2, Light 1, Milling 3, Perspiration 3, Sea water 3-4, Washing 3, 3, 4

Soluble in water (red violet)

Soluble in ethanol (violet)

H₂SO₄ conc. — golden yellow to brown yellow; on dilution — pale green

Aqueous solution + NaOH — decolorised to pale dull grey blue

42625 C.I. Acid Blue 17 (Reddish blue)

Condense *p*-dimethylaminobenzoyl chloride with *N*-methyldiphenylamine, disulfonate the product, and convert to the sodium salt

Discoverers — Fuchs and Hörmann 1885

M.L.B., BP 4961/84; GP 34463 (Fr. 1, 88)

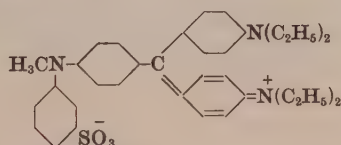
Suter, *Organic Chemistry of Sulfur* (1944), 245

Soluble in water (blue)

Slightly soluble in ethanol (blue)

H₂SO₄ conc. — orange yellow; on dilution — blue

Aqueous solution + NaOH — colourless

42630 Acid Dye

Condense 4,4'-bis(diethylamino)benzophenone with *N*-methyldiphenylamine and phosphorus oxychloride in toluene and monosulfonate the product

Discoverer — Müller 1886

Alkali Violet (Ciba) (K); 6B (Ciba) (B); LR (By); C, CA (C); O (MLB); A (tM). Neutral Violet (WDC)

Dyes wool under acid, neutral, and alkaline conditions
Badische Co., BP 5038/84; USP 353264; FP 160090; GP 27789 (Fr. 1, 80)

BIOS 959, 1. No. 2

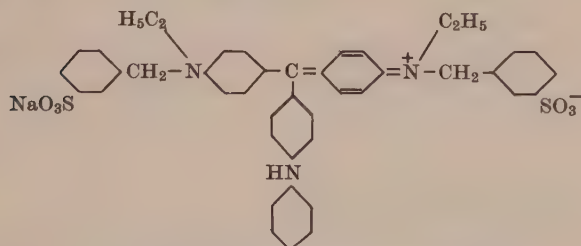
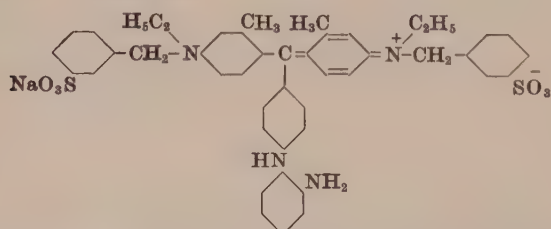
FIAT 764 — Alkaliviolet R; Alkaliviolet ex. A (f. Lack)

Soluble in water (bluish violet)

Soluble in ethanol (blue)

H₂SO₄ conc. — yellowish-brown; on dilution — brown with dull green ppt.

Aqueous solution + NaOH — blue ppt.

42634 C.I. Acid Blue 269**42635 Acid Dye**

Discoverers — O. Wahl, E. Teupel, and K. Schmidt 1933

Wool Discharge Blue GN (IG), Wool Blue NG extra (IG)

Dyes wool in presence of a weak acid bright blue of good fastness to sea water and moderate fastness to light

I.G., BP 439200; USP 2039571; FP 773820; GP 607487 (Fr. 21, 785)

FIAT 764 — Wollaetzbau GN

Soluble in water (cornflower blue)

Soluble in ethanol (pure blue)

H₂SO₄ conc. — yellow brown; on dilution — green

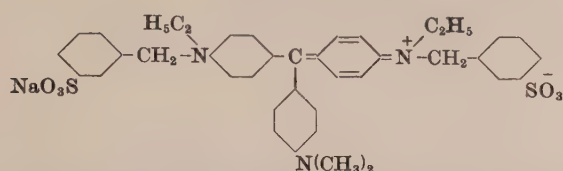
Aqueous solution + NaOH — pale red brown

Condense benzaldehyde (1 mol.) with *N*-benzyl-*N*-ethyl-*m*-toluidine (2 mol.), trisulfonate, oxidise with lead peroxide, and condense with *o*-phenylenediamine

42640 C.I. Acid Violet 49 (Bright bluish violet)

C.I. Food Violet 2 (Bright violet)

42640:1 is the aluminium salt, used in pharmaceuticals



(a) Condense *p*-dimethylaminobenzaldehyde (1 mol.) with α -(*N*-ethylanilino)-*m*-toluenesulfonic acid (2 mol.), oxidise the product and convert to the sodium salt

(b) Condense α -(*N*-ethylanilino)-*m*-toluenesulfonic acid with formaldehyde and oxidise in presence of *N,N*-dimethylaniline

Discoverers — Schultz and Zierold 1889

Agfa, BP 7550/89; FP 198415; GP 50782 (Fr. 2, 47)

Cassella Co., BP 857/91; USP 464538; FP 211026; GP 62339 (Fr. 3, 117)

Geigy, BP 21284/90; GP 59811 (Fr. 3, 115)

FIAT 1313, 2, 345

FIAT 764 — Formylviolett S4BN

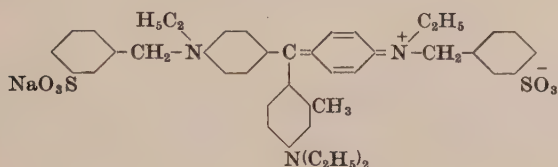
Very soluble in cold and hot water (violet)

Soluble in ethanol (violet)

H₂SO₄ conc. — orange; on dilution — mustard

Aqueous solution + NaOH — dull blue ppt.

42645 C.I. Acid Blue 15 (Bright blue)



Condense formaldehyde (1 mol.) with α -(*N*-ethylanilino)-*m*-toluenesulfonic acid (2 mol.), and oxidise with dichromate-sulfuric acid in the presence of *N,N*-diethyl-*m*-toluidine

Discoverer — A. Hausdörfer 1910

FIAT 1313, 2, 344

FIAT 764 — Brillantwalkblau B

Slightly soluble in cold, soluble in hot water (bright blue)

Soluble in ethanol (bright blue)

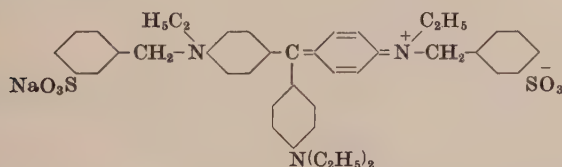
H₂SO₄ conc. — golden yellow; on dilution — pale yellow green

Aqueous solution + NaOH — pale blue with ppt.

42650 C.I. Acid Violet 17 (Bright bluish violet)

C.I. Food Violet 1 (Bright bluish violet)

42650:1 is the aluminium salt, used in pharmaceuticals



Condense α -(*N*-ethylanilino)-*m*-toluenesulfonic acid with formaldehyde, (a) oxidise to the hydrol, condense with *N,N*-diethylaniline, oxidise and convert to the sodium salt, or (b) directly oxidise with dichromate-sulfuric acid in the presence of *N,N*-diethylaniline

Discoverers — Sandmeyer 1890; Weinberg 1890

Geigy, BP 21284/90; GP 59811 (Fr. 3, 115)

Cassella Co., BP 857/91; USP 464538; FP 211026; GP 62339 (Fr. 3, 117)

FIAT 764 — Formylviolett S4B

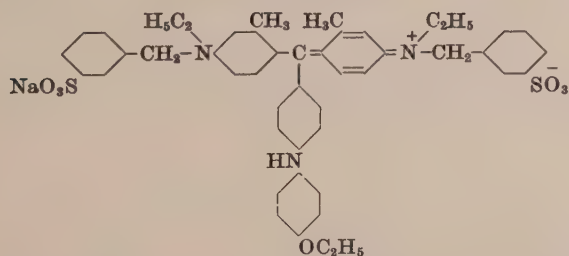
Very soluble in cold and hot water (violet)

Very soluble in ethanol (violet blue)

H₂SO₄ conc. — reddish yellow; on dilution — weak green

Aqueous solution + NaOH — weak dull violet

42655 C.I. Acid Blue 90 (Bright blue)



Condense benzaldehyde (1 mol.) with *N*-benzyl-*N*-ethyl-*m*-toluidine (2 mol.), sulfonate the product to the trisulfonic acid, oxidise with lead peroxide, and react with *p*-phenetidine whereby the sulfonic acid group in the phenyl ring is replaced with the *p*-phenetidino group

Discoverer — M. Weiler 1913

Bayer Co., BP 275609; USP 1218232, 1731637; FP 474260; GP 287003, 293352, (Fr. 12, 210, 915), 292998, 293322, (Fr. 13, 337, 338)

BIOS 1157, 53. FIAT 1313, 2, 339

FIAT 764 — Brillantindocyanin G

Fierz-David, suppl. (1935), 13

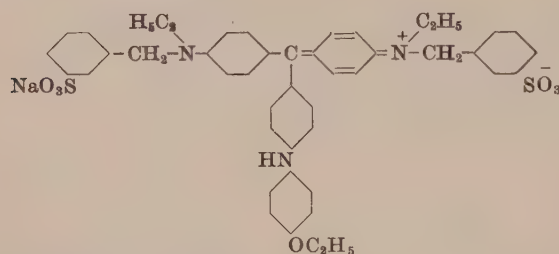
Slightly soluble in cold, soluble in hot water (bright blue)

Soluble in ethanol (bright blue)

H₂SO₄ conc. — blood red; on dilution — orange red

Aqueous solution + NaOH — violet

42660 C.I. Acid Blue 83 (Bright blue)

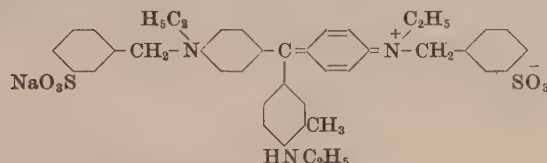


Discoverer — M. Weiler 1913

Bayer Co., BP 275609; USP 1218232, 1731637; FP 474260, 636600; GP 287003, 293352, (Fr. 12, 210, 915), 292998, 293322, (Fr. 13, 337, 338)
 BIOS 1157, 53. FIAT 1313, 2, 337
 FIAT 764 — Brillantindocyanin 6B
 Fierz-David, suppl. (1935), 13

Insoluble in cold, slightly soluble in hot water (bright red blue)
 Slightly soluble in ethanol (bright blue)
 H₂SO₄ conc. — orange red; on dilution — cornflower blue
 Aqueous solution + NaOH — violet

42665 C.I. Acid Violet 72 (Bright bluish violet)



Discoverer — Bayer Co.

Acid Violet CBB (By)
 FIAT 764 — Saeureviolett CBB

Soluble in water (violet)
 Soluble in ethanol (violet)
 H₂SO₄ conc. — golden yellow to golden orange; on dilution — pale green
 Aqueous solution + NaOH — dull violet ppt.

42666 Acid Dye

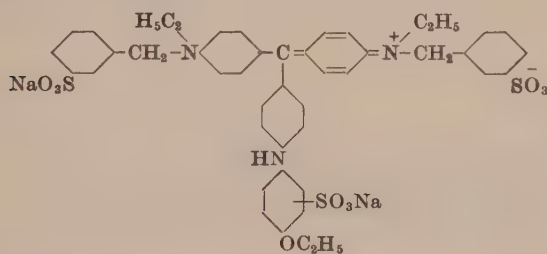
Probably a mixture of C.I.42650 and C.I.42665

Discoverer — I.G.

FIAT 764 — Guineaviolett R kz., Saeureviolett CBB

Condense formaldehyde (1 mol.) with α -(*N*-ethylanilino)-*m*-toluenesulfonic acid (2 mol.), oxidise the product with dichromate-sulfuric acid in the presence of *N*-ethyl-*o*-toluidine

42670 Acid Dye



Discoverer — M. Weiler 1913

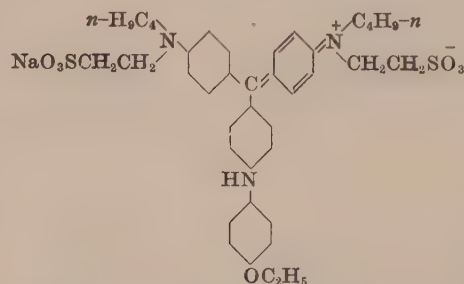
Brilliant Indocyanine 6BS (IG)

Dyes wool in presence of weak acid in bright blue shades of poor to moderate fastness to light and good fastness to washing

Patents as for C.I.42660
 FIAT 764 — Brillantindocyanin 6BS

Sulfonate C.I.42660 with sulfuric acid monohydrate

42675 C.I. Acid Blue 100 (Bright blue)

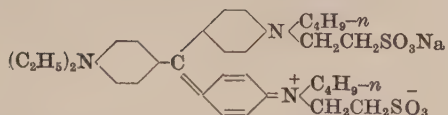


Discoverer — I.G. 1931

I.G., BP 387956, 420307, 421592, 430499; USP 1921334, 2003407; FP 742756; GP 574021 (Fr. 19 1574), 590748 (Fr. 20, 1040), 597078, 606248, (Fr. 21, 794, 792)
 FIAT 764 — Brillantindocyanin 7BF

Condense *p*-chlorobenzaldehyde (1 mol.) with *N*-butyl-*N*-phenyl-taurine (2 mol.), oxidise the product with dichromate-oxalic acid, and fuse with *p*-phenetidine

42680 C.I. Acid Violet 23 (Bright violet)



Condense formaldehyde (1 mol.) with *N*-butyl-*N*-phenyltaurine (2 mol.), and oxidise with dichromate-sulfuric acid in presence of *N,N*-diethylaniline

Discoverer — I.G. 1931

Brilliant Acid Violet 6B (IG)

I.G., BP 387956, 420307, 421592, 430499; USP 1921334, 2003407; FP 742756; GP 574021 (Fr. 19, 1574), 590748 (Fr. 20, 1040), 597078, 606248, (Fr. 21, 794, 794) FIAT 764 — Brillantsaeureviolett 6B

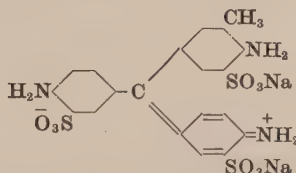
Soluble in water (violet)

Very soluble in ethanol (violet)

H₂SO₄ conc. — golden yellow; on dilution — blue green

Aqueous solution + NaOH — decolorised to very pale violet

42685 C.I. Acid Violet 19 (Bright reddish violet)



Trisulfonate C.I.42510 with oleum and convert the product into the sodium or ammonium salt

Discoverer — Caro 1877

Badische Co., BP 3731/77; USP 250201; FP 122721; GP 2086 (Fr. 1, 108)

Read Holliday & Sons, USP 250247

Jacobsen, BP 2828/79; GP 8764 (Fr. 1, 110)

FIAT 764 — Saeurefuchsin O and Kaliumsalz Schoop, Chem. Zeitsch. 11 (1887), 572

Soluble in cold and hot water (bluish red)

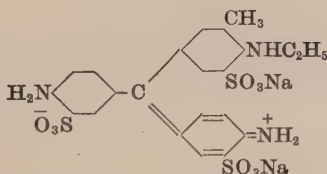
Insoluble in ethanol

H₂SO₄ conc. — orange; on dilution — red violet

Aqueous solution + NaOH — decolorised

42690 Acid Dye

A mixture of the sodium salts of the di- and tri-sulfonic acids obtained by sulfonation of *N*-ethylrosaniline (Red Violet 5R) with oleum, and mainly



Discoverer — Caro 1877

Red Violet 5RS (B)

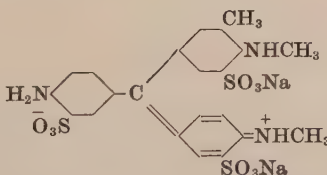
Badische Co., BP 3731/77; USP 204798; GP 2096 (Fr. 1, 108) FIAT 764 — Rotviolett für Fanalfarben

Soluble in water (magenta red)

Insoluble in alcohol

H₂SO₄ conc. — yellow; on dilution — magenta red

42695 Acid Dye



Trisulfonate *N,N'*-dimethylrosaniline with oleum and convert to the sodium salt

Discoverer — Caro 1877

Acid Violet 4RSN (SCI), 4RS (MLB), Red Violet 4RS (B)

Dyes wool in presence of acid in bluish violet shades of poor fastness to light and washing

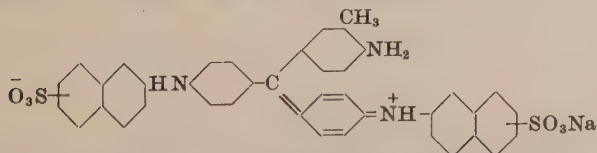
Badische Co., BP 3731/77; USP 204797, 204798; GP 2096 (Fr. 1, 108)

Soluble in water (magenta red)

H₂SO₄ conc. — brownish yellow; on dilution — magenta red

Aqueous solution + NaOH — pale reddish yellow on heating

42700 C.I. Direct Blue 41 (Bright greenish blue)



Heat C.I.42510 with 2-naphthylamine, disulfonate the product and convert to the sodium salt

Discoverer — Meldola 1883

Meldola, Chem. News, 47 (1883), 133, 146

Nölting & Collin, Ber. 17 (1884), 259

FIAT 764 — Brillantreinblau 8G, 8GZ

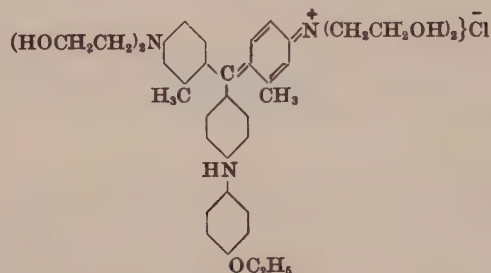
Slightly soluble in cold, soluble in hot water (green blue)

Insoluble in ethanol

H₂SO₄ conc. — reddish brown; on dilution — blue ppt.

Aqueous solution + NaOH — violet black and ppt.

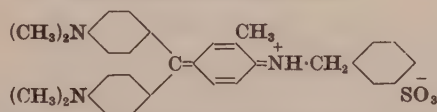
42705 C.I. Basic Blue 18 (Bright blue)



Discoverers — P. Wolff and W. Werner
I.G., BP 425041; USP 2044963; GP 606078 (Fr. 21, 784)
BIOS 1433, 40
FIAT 764 — Astracyanin B

Condense 2,2'-(*m*-tolylimino)diethanol (2 mol.) with *p*-chloro-benzaldehyde at 100°C in very dilute sulfuric acid, precipitate the base by ammonia, dissolve the ppt. in dilute hydrochloric acid, oxidise with dichromate–oxalic acid, and condense with *p*-phenetidine

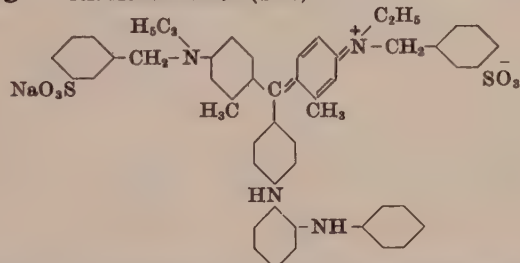
42710 C.I. Acid Violet 38 (Bluish violet)



Discoverer — Badische Co.
Alkali Violet 3ROO (B)
BIOS 959, 2
FIAT 764 — Alkaliviolett 3ROO

Condense 4,4'-bis(dimethylamino)benzophenone and *N*-benzyl-*o*-toluidine with phosphorus oxychloride, and sulfonate the product with 30% oleum

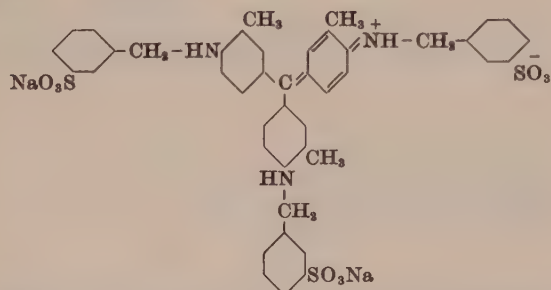
42715 C.I. Acid Blue 91 (Blue)



Discoverers — E. Teupel and O. Wahl
Brilliant Discharge Blue G (IG)
I.G., BP 449090; FP 773820; GP 637939 (Fr. 23, 702)
FIAT 764 — Brillantaetzbau G
Fierz-David, Blangey & Stamm, *Helv. Chim. Acta*, 25 (1942), 1162

Condense benzaldehyde (1 mol.) with *N*-benzyl-*N*-ethyl-*m*-toluidine (2 mol.), trisulfonate the product with oleum, oxidise with lead peroxide and finally react with *N*-phenyl-*o*-phenylenediamine, which replaces the sulfonic acid group originally introduced in the *para* position of the unsubstituted phenyl nucleus

42720 Acid Dye



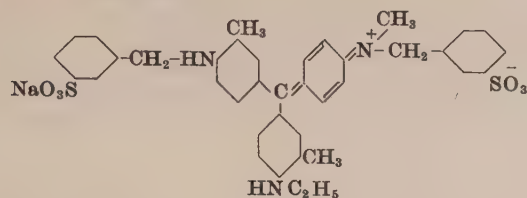
Condense formaldehyde (1 mol.) with *α*-*o*-toluidino-*m*-toluene-sulfonic acid (2 mol.), and air oxidise the product formed with *α*-*o*-toluidino-*m*-toluenesulfonic acid (1 mol.) in the presence of cupric chloride

Discoverer — Bayer Co.

Acid Violet 3R (By)

Wool dyed in presence of sulfuric acid and silk with acetic acid to violet shades; levelling moderate
Fastness Properties (C): Alkali 4, Light 1, Milling 3, Perspiration 3-4, Sea water 4, Washing 3
FDX 885 — Saeureviolett 3R

Soluble in water (red violet)
Slightly soluble in ethanol (violet)
H₂SO₄ conc. — golden yellow; on dilution — red violet
Aqueous solution + NaOH — red violet to wine red ppt.

42725 Acid Dye

Condense formaldehyde (1 mol.) with α -(*N*-methylanilino)-*m*-toluenesulfonic acid (1 mol.) and *N*-ethyl-*o*-toluidine (1 mol.), and air oxidise the product formed with α -*o*-toluidino-*m*-toluenesulfonic acid in the presence of copper salts

Discoverer — Bayer Co. 1896

Acid Violet R extra

Wool dyed from a sulfuric acid and silk from an acetic acid or neutral dyebath; levelling moderate, suitable for direct print styles

Fastness Properties (C): Alkali 4-5, Milling 2-3, Perspiration 3, Sea water 3, Washing 3, 3, 3

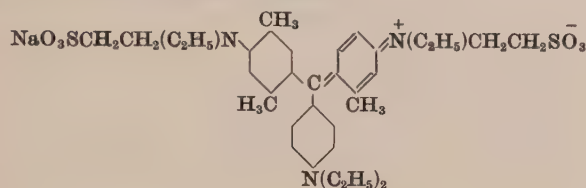
FIAT 764 — Saeureviolett R ex.

Soluble in water (red violet)

Soluble in ethanol (violet)

H₂SO₄ conc. — golden yellow; on dilution — cornflower blue

Aqueous solution + NaOH — pale wine red

42730 C.I. Acid Blue 24 (Blue)

Condense *p*-diethylaminobenzaldehyde (1 mol.) with *N*-ethyl-*N*-*m*-tolyltaurine (2 mol.) in sulfuric acid, and oxidise with dichromate-oxalic acid

Discoverer — I.G. 1931

I.G., BP 387956, 420307, 421592, 430499; USP 1921334, 2003407; FP 742756; GP 574021 (Fr. 19, 1574), 590748 (Fr. 20, 1040), 597078, 606248, (Fr. 21, 794, 792)

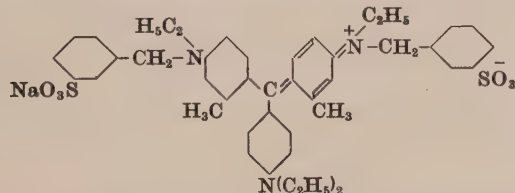
FIAT 764 — Saeurebrillantblau R

Soluble in water (blue violet to violet blue)

Soluble in ethanol (pure blue)

H₂SO₄ conc. — yellow to golden yellow; on dilution — light green

Aqueous solution + NaOH — unchanged

42735 C.I. Acid Blue 104 (Bright blue)

Condense *p*-diethylaminobenzaldehyde (1 mol.) with α -(*N*-ethyl-*m*-toluidino)-*m*-toluenesulfonic acid (2 mol.), and oxidise with dichromate-oxalic acid

Discoverer — A. Hausdörfer 1900

Bayer Co., BP 18448/00; GP 125134 (Fr. 6, 258)

FIAT 1313, 2, 343

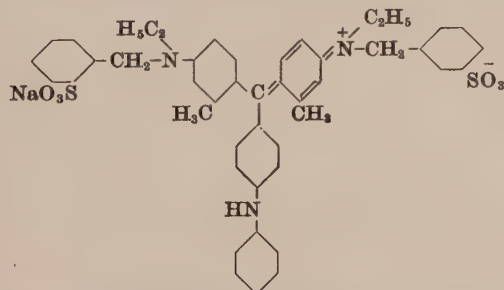
FIAT 764 — Brillantwollblau FFR extra

Very soluble in water (violet blue)

Very soluble in ethanol (pure blue)

H₂SO₄ conc. — yellow to golden yellow; on dilution — citron yellow

Aqueous solution + NaOH — cornflower blue and ppt.

42740 C.I. Acid Blue 109 (Bright blue)

(a) Condense benzaldehyde (1 mol.) with *N*-benzyl-*N*-ethyl-*m*-toluidine (2 mol.), trisulfonate, oxidise with lead peroxide, and condense with aniline, replacing the *para* sulfonic acid group with the anilino group

(b) Condense *p*-chlorobenzaldehyde (1 mol.) with α -(*N*-ethyl-*m*-toluidino)-*m*-toluenesulfonic acid (2 mol.), oxidise and condense with aniline

Discoverer — M. Weiler 1913

Bayer Co., BP 275609; USP 1218232, 1731637; FP 474260/636600; GP 287003, 293352, (Fr. 12, 210, 915), 292998, 293322, (Fr. 13, 337, 338)

FIAT 1313, 2, 341

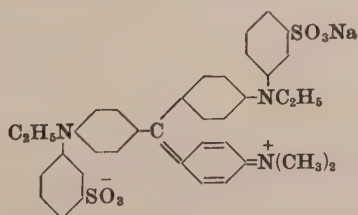
FIAT 764 — Brillantwollblau FFB ex.

Very soluble in water (violet blue)

Very soluble in ethanol (pure blue)

H₂SO₄ conc. — yellow brown; on dilution — olive yellow

Aqueous solution + NaOH — red brown and ppt.

42745 C.I. Acid Violet 25 (Bluish violet)

Condense *p*-dimethylaminobenzoyl chloride with *N*-ethyldiphenylamine, and disulfonate the product

Discoverer — Müller 1884

Acid Violet 7B (IG)

M.L.B., BP 4961/84; USP 353266; FP 181351; GP 34463 (Fr. 1, 88)

Soluble in water (bluish violet)

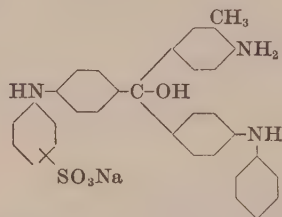
Soluble in ethanol (bluish violet)

H₂SO₄ conc. — orange brown; on dilution — olive green to bluish green

Aqueous solution + NaOH — bluish violet ppt.

42750 C.I. Acid Blue 110 (Blue)
42750:1 (C.I. Pigment Blue 19) is the acid derivative

Carbinol base

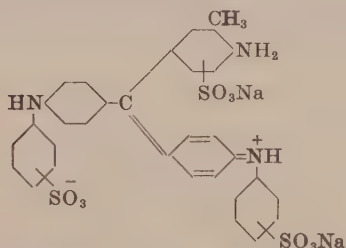


Sulfonate **C.I.42775** with conc. sulfuric acid and convert to the sodium salt

Discoverers — Nicholson 1862; Gilbee 1862
 Nicholson, *BP* 1857/62
 Gilbee, *BP* 1939/62
 Bulk, *Ber.* 5 (1872), 417
 Knecht & Batey, *JSDC*, 25 (1908), 198
BIOS 1433, 35–37; *BIOS-MISC* 20, App. 72
FIAT 764—Alkaliblau 2, 4, 7, H5B

Insoluble in cold, slightly soluble in hot water (colourless)
 Slightly soluble in ethanol
 H_2SO_4 conc. — brownish red; on dilution — blue ppt.

42755 C.I. Acid Blue 22 (Blue)

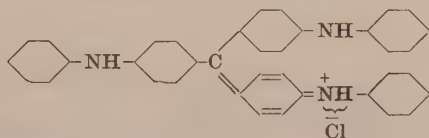


Trisulfonate **C.I.42775** with conc. sulfuric acid and convert to the sodium salt

Discoverer — Nicholson 1862
 Nicholson, *BP* 1857/62
 Friedländer, 1, 105, 106
 Bulk, *Ber.* 5 (1872), 419
 Erhardt, *Dingl.* 230 (1878), 346
 Knecht & Batey, *JSDC*, 25 (1909), 198
FIAT 764 — Wasserblau I alt, Kristalle B, R, and TR

Soluble in cold and hot water (blue)
 Slightly soluble in ethanol
 H_2SO_4 conc. — reddish yellow; on dilution — blue with blue ppt.
 Aqueous solution + NaOH — brownish red

42760 C.I. Solvent Blue 23 (Greenish blue)



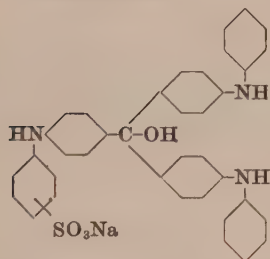
Heat **C.I.42500** with excess aniline in presence of benzoic acid at about 180°C

Discoverers — Girard and de Laire 1866
 Girard & de Laire, *BP* 1093/66, 2686/66; *FP* 70876, 75101, 75168
BIOS 1433, 30
FIAT 764 — Blau II T Base

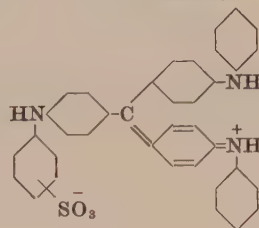
Insoluble in water
 Slightly soluble in alcohol (blue)
 H_2SO_4 conc. — brownish yellow; on dilution — blue ppt.

42765 C.I. Acid Blue 119 (Blue)
42765:1 (C.I. Pigment Blue 61) is the acid derivative

Carbinol base



Blue dye

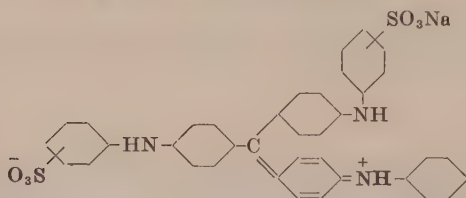


Sulfonate **C.I.42760** with conc. sulfuric acid, and convert to the sodium salt

Discoverers — Nicholson 1862; Girard and de Laire 1866
 Manual, 544

Insoluble in cold, soluble in hot water (blue)
 Soluble in ethanol (greenish blue)
 H_2SO_4 conc. — reddish-brown; on dilution — blue ppt.

42770 C.I. Acid Blue 48 (Blue)*
42770:1 (C.I. Pigment Blue 18) is the acid derivative



Discoverer — Nicholson 1862
 Kalle, *Z. Chem. Grossgew.* 1 (1877), 189
 Bulk, *Ber.* 5 (1872), 419
BIOS 1433, 30
FIAT 764 — Reflexblau B

Very soluble in cold and hot water (blue)
 Soluble in ethanol (greenish blue)
 H_2SO_4 conc. — reddish brown; on dilution — blue with bluish violet ppt.
 Aqueous solution + NaOH

Disulfonate **C.I.42760** and convert to the sodium salt

* On silk

42775 C.I. Solvent Blue 3 (Blue)

Hydrochloride, sulfate or acetate of variable mixtures of *N*-phenylated pararosaniline and rosaniline, obtained by heating **C.I.42510** with an excess of aniline in the presence of benzoic acid (for the best blue brands), or of acetic acid or sodium acetate (for red brands) at about 180°C

Formerly used as a basic dye

Insoluble in water

Readily soluble in ethanol

H₂SO₄ conc. — brownish yellow; on dilution — blue ppt.

Aqueous solution + NaOH — brown red

Discoverers — Girard and de Laire 1861; Nicholson 1862; Monnet and Drury 1862; Wanklyn (use of benzoic acid) 1862

Spirit Blue, various brands

Girard & de Laire, *FP* 45826

Nicholson, *BP* 1857/62; *FP* 54827

Monnet & Drury, *BP* 1939/62

FIAT 764 — Spritblau T

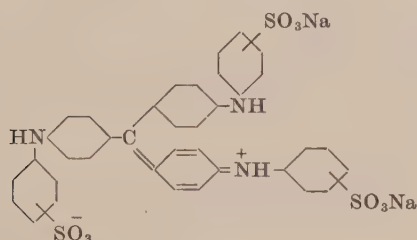
Girard & de Laire, *Dingl.* **162** (1861), 297; **170** (1863), 58; *Jahresber.* (1862), 696

Baeyer & Villiger, *Ber.* **37** (1904), 2870

Knecht, *JSDC*, **21** (1905), 295; **23** (1907), 119

Lambrecht, *Ber.* **40** (1907), 249

Knecht, *Deutscher Färberkalender*, (1909), 86

42780 C.I. Acid Blue 93 (Bright blue)

Discoverers — A. W. Hofmann 1858; Nicholson 1862; Girard and de Laire 1866; K. Heumann 1892; Sandmeyer 1892; M. Weiler 1906

Nicholson, *BP* 1857/62

Bayer Co., *BP* 8634/92; *GP* 66511 (*Fr.* **3**, 102)

(*Fr.* **3**, 115)

Geigy, *BP* 12720/92; *USP* 538215; *FP* 223032; *GP* 73092 (*Fr.* **3**, 115)

Erhardt, *Dingl.* **230** (1878), 342

Knecht & Batey, *JSDC*, **25** (1909), 198

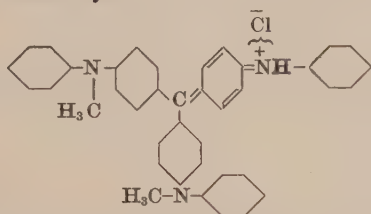
Very soluble in cold and hot water (blue)

H₂SO₄ conc. — reddish brown; on dilution — blue violet

(a) Trisulfonate **C.I.42760** and convert to the sodium salt

(b) Condense formaldehyde with *N*-phenylsulfanilic (or metanilic) acid (2 mol.) and oxidise the product formed in presence of another mol. of the latter compound

(c) Condense diphenylamine with carbon tetrachloride and sulfonate the product

42785 Basic Dye

Discoverers — Girard 1874; Bardy and Dusart

Methyldiphenylamine Blue (MLB)

Girard, *BP* 2347/74

M.L.B., *GP* 8251 (*Fr.* **1**, 66)

Girard, *Ber.* **9** (1876), 641

Chem. Ind. **2** (1879), 429

Neumann & Gould, *Anal. Chem.* **25** (1953), 751

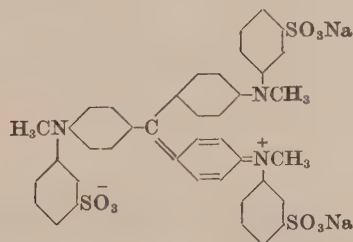
Feigl, *Spot Tests*, **2** (1954), 257

Insoluble in water

Soluble in ethanol (blue)

H₂SO₄ conc. — brown yellow; on dilution — blue ppt.

React *N*-methyldiphenylamine with oxalic acid

42790 Acid Dye

Discoverer — M.L.B. 1884

Hoechst New Blue (MLB)

Wool dyed to a blue shade from a neutral dyebath followed by treatment in dilute acid. Silk dyed from a faintly acid soap bath. Moderate fastness to light and washing

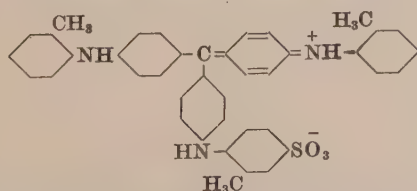
M.L.B., *BP* 4761/84; *GP* 34463 (*Fr.* **1**, 88)

Soluble in water (blue)

Slightly soluble in ethanol

H₂SO₄ conc. — brownish red; on dilution — blue with ppt.

Condense *N*-methyldiphenylamine with phosgene and trisulfonate the product

42795 C.I. Pigment Blue 57 (Reddish blue)

Discoverer — I.G.

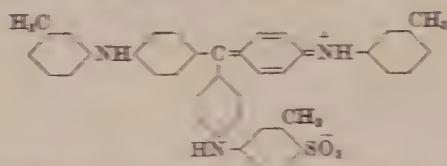
Pigment for printing inks with similar properties to **C.I. Pigment Blue 18**

BIOS 1433, 32

FIAT 764 — Reflexblau RB

Heat **C.I.42500** with excess *o*-toluidine in presence of benzoic acid at 180–185°C for 1½–2 hours, and sulfonate with conc. H₂SO₄

42800 C.I. Pigment Blue 56 (Greenish blue)



Heat C.I.42500 with excess *m*-toluidine in presence of benzoic acid at 180–185°C for 1½–2 hours, and sulfonate with 90% H₂SO₄.

Discoverer — I.G.

Reflex Blue 2G (IG)

Pigment for printing inks with similar properties to

C.I. Pigment Blue 18

BIOS 1433, 35; BIOS-MISC 20, App. 73

FDX 885

FIAT 764 — Reflexblau 2G

(c) Aminohydroxy derivatives of Triphenylmethane

43500 Mordant Dye



Condense 4,4'-bis(dimethylamino)benzhydrol with salicylic acid and oxidise the product

Discoverer — Runkel 1890

Chrome Violet (By)

Dyes chrome-mordanted wool violet. Moderately fast to milling and washing but not fast to light. Used mainly in calico printing with a chromium mordant

Bayer Co., BP 14621/90; USP 476413, 476414; FP 208330, GP 58483 (Fr. 3, 120)

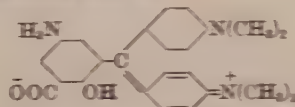
Slightly soluble in water (green)

Slightly soluble in ethanol (reddish violet)

H₂SO₄ conc. — yellowish brown; on dilution — red brown

Aqueous solution + NaOH — reddish violet and black ppt.

43505 C.I. Mordant Red 29



Condense 4,4'-bis(dimethylamino)benzhydrol with 5-aminosalicylic acid and oxidise the product formed

Discoverer — Bayer Co. 1891

Bayer Co., BP 14621/90; FP 208330; GP 58483 (Fr. 3, 120)

Chem. Ind. 15 (1892), 373

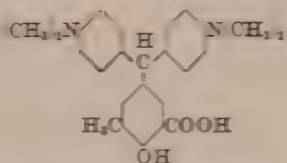
Insoluble in water

Slightly soluble in boiling ethanol (red)

H₂SO₄ conc. — bluish red; on dilution — reddish brown ppt.

Aqueous solution + NaOH — brownish red

43510 C.I. Mordant Violet 6 (Bright violet)



Treat *N,N*-dimethylaniline with formaldehyde and *N,N*-dimethyl-*p*-nitrosoaniline hydrochloride in sulfuric acid solution, and then react with 2,3-cresotic acid. The product is oxidised on the fibre

Discoverers — Bayer Co.; Agfa 1912

Bayer Co., GP 67429 (Fr. 3, 126); Agfa, GP 250366 (ap. A 20544) (Fr. 10, 236)

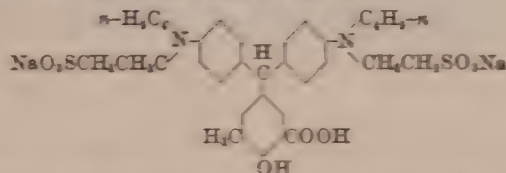
Slightly soluble in water (light grey violet)

Soluble in ethanol (violet)

H₂SO₄ conc. — light yellow brown; on dilution — salmon colour

Aqueous solution + NaOH — pale violet ppt.

43515 C.I. Mordant Violet 8 (Bright violet)



Condense 5-formyl-2,3-cresotic acid (1 mol.) with *N*-butyl-*N*-phenyltaurine (2 mol.). The product is developed on the fibre by chroming

Discoverers — H. Krzikalla and C. Thode 1936

I.G., BP 472407; FP 816768; GP 654573 (Fr. 24, 262)

BIOS-MISC 20, App. 28

FIAT 1313, 2, 356

FIAT 764 — Chromoxanbrillantviolett BR

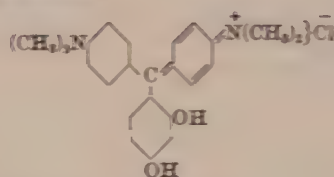
Soluble in water (bluish green)

Soluble in ethanol (green)

H₂SO₄ conc. — light golden yellow; on dilution — light blue green

Aqueous solution + NaOH — bright red violet

43520 Basic Dye

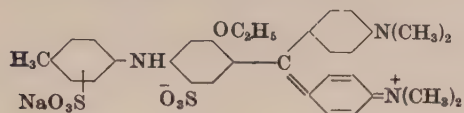


Condense resorcinol with *p,p'*-(dichloromethylene)bis[*N,N*-dimethylaniline]

Discoverer — Caro 1883

Resorcine Violet

Bayer Co., GP 58483 (Fr. 3, 120)

43525 C.I. Acid Violet 15 (Bright reddish blue → Bluish violet)

Condense 4,4'-bis(dimethylamino)benzophenone with *N*-*p*-tolyl-*m*-phenetidine and phosphorus oxychloride, then disulfonate and convert into the sodium salt

Discoverer — Müller 1891

Badische Co., *BP* 11275/91; *USP* 501434; *FP* 214571; *GP* 62539

(*Fr.* 3, 142)

BIOS 1433, 53

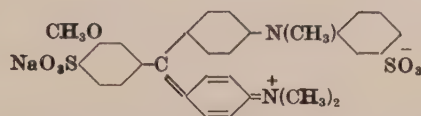
FIAT 764 — Saeureviolett 6BNOO 3130

Soluble in water (blue violet)

Soluble in ethanol (blue violet)

H₂SO₄ conc. — brown; on dilution — violet red to bluish violet

Aqueous solution + NaOH — slowly decolorised

43530 Acid Dye

Condense 4'-dimethylamino-3-methoxybenzophenone with *N*-methylphenylamine and phosphorus oxychloride, then disulfonate and convert to the sodium salt

Discoverers — Fuchs and Kees 1890

Ketone Blue 4BN (MLB)

Dyes wool and silk pure blue shades fast to acids and washing

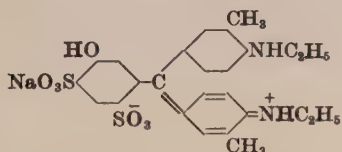
M.L.B., *BP* 8269/92; *FP* 221333; *GP* 65952 (*Fr.* 3, 164)

Soluble in water (blue)

Soluble in alcohol

H₂SO₄ conc. — reddish-yellow; on dilution — bluish green

Aqueous solution + NaOH — brownish red

43535 Acid Dye

Condense *m*-hydroxybenzaldehyde with *N*-ethyl-*o*-toluidine (2 mol.), disulfonate the product, oxidise, and convert to the sodium salt

Discoverer — Weinberg 1891

Cyanol FF (C)

Dyes wool and silk from a sulfuric acid bath in bright bluish shades of poor to moderate fastness to light and washing

Cassella Co., *BP* 15143/91; *USP* 472091; *FP* 215835; *GP* 73717

(*Fr.* 3, 158)

Hickman & Linstead, *JCS*, 121 (1922), 2504

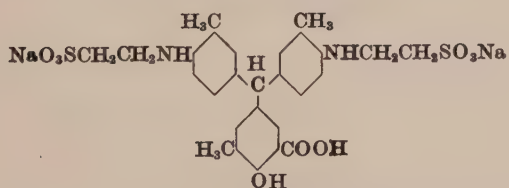
Holmes, *Ind. Eng. Chem.* 15 (1923), 833

Soluble in water (reddish blue)

Very soluble in ethanol (royal blue)

H₂SO₄ conc. — yellow; on dilution — yellowish green to blue

Aqueous solution + NaOH — dichroic green and red, converted into wine red on boiling

43540 C.I. Mordant Violet 23 (Bright reddish violet)

Condense 5-formyl-2,3-cresotic acid with *N*-*o*-tolyltaurine. The product is developed on the fibre by chroming

Discoverers — H. Krzikalla and C. Thode 1936

I.G., *BP* 472407; *FP* 816768; *GP* 654573 (*Fr.* 24, 562)

BIOS 1433, 125. *FIAT* 1313, 2, 365

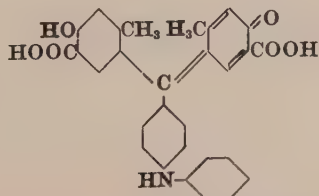
FIAT 764 — Chromoxanbrillantviolett 5R

Very soluble in water (red violet)

Very soluble in ethanol (violet)

H₂SO₄ conc. — golden yellow; on dilution — pale violet

Aqueous solution + NaOH — decolorised

43545 Mordant Dye

Condense *p*-chlorobenzaldehyde (1 mol.) with 2,4-cresotic acid (2 mol.) oxidise the product with nitrosylsulfuric acid, and condense with aniline

Discoverers — A. Stock and F. Heim 1909

Chromogen Blue R (By)

M.L.B., *BP* 1213/10; *USP* 995494; *FP* 417490; *GP* 227105

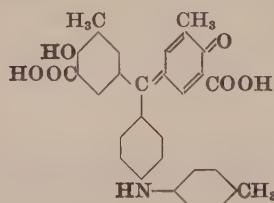
(*Fr.* 10, 233)

Soluble in water (corinth)

Soluble in ethanol (violet)

H₂SO₄ conc. — orange brown; on dilution — wine red

Aqueous solution + NaOH — wine red

43550 C.I. Mordant Violet 11 (Bright bluish violet)

(a) Condense benzaldehyde (1 mol.) with 2,3-cresotic acid (2 mol.) in sulfuric acid solution, sulfonate the condensation product with monohydrate, oxidise the product with nitrous acid, and condense with *p*-toluidine

(b) Condense *p*-chlorobenzaldehyde (1 mol.) with 2,3-cresotic acid, oxidise, and react the product with *p*-toluidine and its hydrochloride

Discoverers — A. Stock and F. Heim 1909; M. Weiler 1914
M.L.B., *BP* 1213/10; *USP* 995494; *FP* 417490; *GP* 227105
(*Fr.* 10, 233)
Bayer Co., *USP* 1218232; *GP* 287003 (*Fr.* 12, 210)
FIAT 1313, 2, 363
FIAT 764 — Chromoxanbrillantviolett SB

Slightly soluble in cold, soluble in hot water (violet)
 H_2SO_4 conc. — bright orange red; on dilution — violet

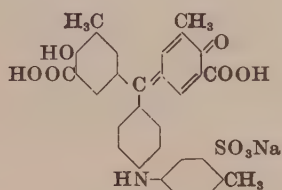
43551 C.I. Mordant Violet 19 (Violet)

Sulfite salt of C.I.43550

Dissolve C.I.43550 in neutral sodium sulfite and evaporate to dryness

Discoverers — B. Franke and H. Moehrke 1926
I.G., *BP* 263879; *USP* 1747541; *GP* 457495 (*Fr.* 16, 832)
FIAT 1313, 2, 364
FIAT 764 — Chromogenviolett B

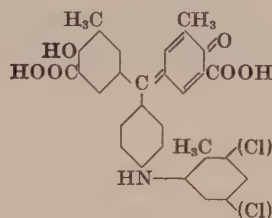
Soluble in water (bordeaux)

43552 C.I. Mordant Violet 36 (Violet)

Sulfonate C.I.43550 with oleum

Discoverer — M. Weiler 1914
Bayer Co., *USP* 1244149; *FP* 515000; *GP* 318956 (*Fr.* 13, 343)
BIOS 1433, 120. *FIAT* 1313, 2, 364
FIAT 764 — Chromoxanbrillantviolett BD

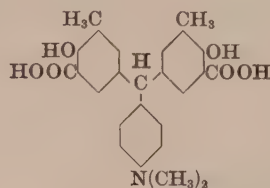
Soluble in water (violet)
 H_2SO_4 conc. — wine red; on dilution — violet

43555 C.I. Mordant Violet 10 (Bright violet)

Condense benzaldehyde (1 mol.) with 2,3-cresotic acid (2 mol.), sulfonate the product with oleum, oxidise with nitrosylsulfuric acid, and condense with 3 and 5-chloro-*o*-toluidine

Discoverers — W. Duisberg, W. Hentrich, and W. Schepss 1923
Bayer Co., *BP* 237096; *USP* 1582909; *FP* 583703; *GP* 411593
(*Fr.* 15, 440)
FIAT 764 — Chromoxanbrillantviolett SR

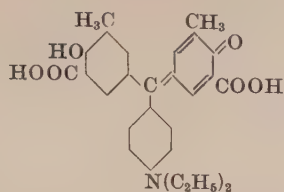
Soluble in water (wine red)
Soluble in ethanol (red violet)
 H_2SO_4 conc. — bright orange red; on dilution — violet
Aqueous solution + NaOH — bright magenta red

43560 C.I. Mordant Violet 15 (Reddish violet)

Condense *p*-dimethylaminobenzaldehyde (1 mol.) with 2,3-cresotic acid (2 mol.), and oxidise on the fibre

Discoverer — Agfa 1911
Agfa, *GP* 250365 (*ap.* A 20224) (*Fr.* 10, 236)
Geigy, *GP* 209535 (*Fr.* 9, 211)
FIAT 764 — Metachromviolett RR

Soluble in water (light currant)
Soluble in ethanol (magenta to wine red)
 H_2SO_4 conc. — pale red orange brown; on dilution — light pink
Aqueous solution + NaOH — very pale currant

43565 C.I. Mordant Violet 1 (Bright violet)

Condense *p*-diethylaminobenzaldehyde (1 mol.) with 2,3-cresotic acid in sulfuric acid solution and oxidise the product with nitrous acid

Discoverer — Geigy 1908

Geigy, *GP* 209535 (*Fr.* 9, 211)

BIOS 1239, 22; 1433, 121; *BIOS-MISC* 20, App. 29

FIAT 1313, 2, 364

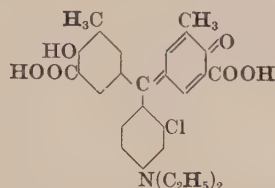
FIAT 764 — Chromoxanbrillantviolett RE

Soluble in cold or hot water (violet red)

Soluble in ethanol (red violet)

H₂SO₄ conc. — bright yellow red; on dilution — cherry red ppt.

Aqueous solution + NaOH — bright red violet prior to decolorisation

43570 C.I. Mordant Violet 28 (Bright bluish violet)

Condense 2-chloro-4-diethylaminobenzaldehyde (1 mol.) with 2,3-cresotic acid (2 mol.) and oxidise the product with nitrosylsulfuric acid

Discoverer — Geigy 1907

Geigy, *GP* 198729 (*Fr.* 9, 210)

FIAT 764 — Chromoxanbrillantviolett BE

Soluble in water (currant)

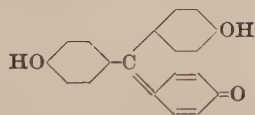
Soluble in ethanol (red violet)

H₂SO₄ conc. — bright magenta red; on dilution — very pale corinth

Aqueous solution + NaOH — red violet

(d) Hydroxy derivatives of Triphenylmethane**43800 Solvent Dye**

Classical names — Aurine, Rosolic Acid



Sodium Salt is Yellow Coralline

Heat phenol with oxalic acid in conc. sulfuric acid

Discoverer — Runge 1834

Corallin Spirit Soluble (B), Spirit Aurine (BSS)

Formerly used as a solvent dye in alcoholic solvents for spirit lacquers. Light, fair; Heat, stable to 140°C; m.p. 130°C

Persoz, *GP* 68976 (*Fr.* 3, 103)

BIOS 569, 12

Runge, *Ann. Phys. Chem.* 31 (1834), 31, 65, 70, 513

Persoz, *Jahresber.* 8 (1862), 583

Caro & Wanklyn, *Z. angew. Chem.* 2 (1866), 563; *Sci. Proc.*

R. Dublin Soc. 15 (1866), 210

Baines & Driver, *JCS*, 123 (1923), 1214; 125 (1924), 907

Spier, *JCS*, 125 (1924), 450

Gomberg & Snow, *JACS*, 47 (1925), 198

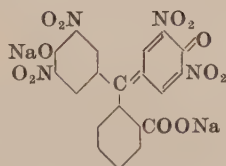
Ramart-Lucas, *Compt. rend.* 213 (1941), 67, 244

Insoluble in water; sodium salt soluble (red)

Soluble in ethanol (golden yellow) sodium salt soluble (magenta red)

H₂SO₄ conc. — yellow; on dilution — yellow with ppt.

Aqueous solution + NaOH — cherry red

43805 Acid Dye

Nitrate phenolphthalein in sulfuric acid

Discoverers — Dreyfus, Bull and Hall 1889

Aurotine (CAC)

Dyes wool or chrome-mordanted wool, or wool in the presence of acetic acid, an orange yellow, the mordanted shade being somewhat faster

Clayton Aniline, *BP* 3441/89; *GP* 52211 (*Fr.* 2, 89)

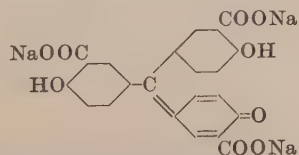
JSDC, 6 (1890), 32

Soluble in water (dark yellow)

Soluble in alcohol (dark yellow)

H₂SO₄ conc. — brownish orange; on dilution — orange ppt.

Aqueous solution + NaOH — sodium stannite — deep indigo blue

43810 C.I. Mordant Violet 39 (Reddish violet)

React formaldehyde (or methyl alcohol and sodium nitrite) with salicylic acid in concentrated sulfuric acid

Discoverer — Sandmeyer 1889

Geigy, *BP* 3333/89; *USP* 410739; *FP* 196292; *GP* 49970 (*Fr.* 2, 50)

Knecht, *JSDC*, 5 (1889), 170

Caro, *Ber.* 25 (1892), 939

Soluble in water (dark red)

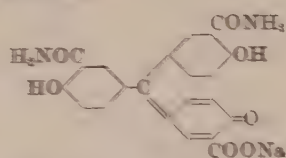
Insoluble in ethanol

H₂SO₄ conc. — brown; on dilution — ppt.

Aqueous solution + NaOH — light brown

43815

Mordant Dye



Condense salicylamide with formaldehyde, then with salicylic acid, oxidise the product with sodium nitrate, and convert into the sodium salt

Discoverers — Alioth and Bodmer 1921

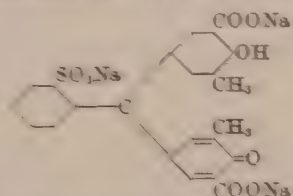
Chrome Garnet B (DH)

Durand & Huguenin, *BP* 166530, 183123; *USP* 1403888; *FP* 529185, and addn. 25268; *Sto.P* 97636, 98560; *GP* 370468, 382428, (*Fr.* 14, 731, 733)

Soluble in water (blue red)

H_2SO_4 conc. — yellow red; on dilution — yellow red ppt.

43820 C.I. Mordant Blue 3 (Bright reddish blue)



Condense *o*-formylbenzenesulfonic acid with 2,3-cresotic acid, oxidise the product with nitrosylsulfuric acid, and convert into the sodium salt

Discoverer — Conzetti 1906

Geigy, *BP* 15204/07; *USP* 877052, 877053, 877054; *FP* 384979; *GP* 189938 (*Fr.* 9, 200)

Bayer Co., *GP* 287004 (*Fr.* 12, 214)

FIAT 764 — Chromoxancyanin R

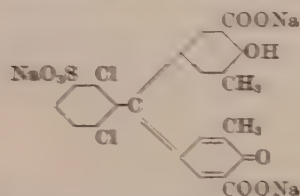
Soluble in cold and hot water (red)

Soluble in ethanol (orange yellow)

H_2SO_4 conc. — orange red; on dilution — orange yellow with red ppt.

Aqueous solution + NaOH — red violet solution

43825 C.I. Mordant Blue 29 (Reddish blue)



Condense a sulfo-*o*-chlorobenzaldehyde (e.g. 2,4-dichloro-3-formylbenzenesulfonic acid) with 2,3-cresotic acid, oxidise the product, and convert into the sodium salt

Discoverer — Conzetti 1906

Geigy, *BP* 15204/07; *USP* 877054; *FP* Cert. d'Addition 9500; *GP* 199943 (*Fr.* 9, 204)

Bayer Co., *GP* 286433, 287004, (*Fr.* 12, 212, 214)

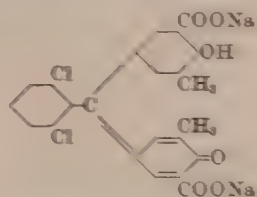
FIAT 764 — Chromoxanreinblau BLD

Soluble in water (brownish yellow) and more sparingly soluble in ethanol (reddish brown)

H_2SO_4 conc. — bright magenta red; on dilution — orange and then orange yellow ppt.

Aqueous solution + NaOH — violet blue

43830 C.I. Mordant Blue 1 (Bright blue → Reddish navy)



Condense 2,6-dichlorobenzaldehyde with 2,3-cresotic acid, oxidise the product, and convert into the sodium salt

Discoverer — Conzetti 1906

Geigy, *BP* 15204/07; *USP* 877053, 877054; *FP* 384979; *GP* 198909, 199943, 213502, (*Fr.* 9, 201, 204, 207), 234027 (*Fr.* 10, 231)

Ciba, *BP* 231446

Bayer Co., *GP* 286433, 287004, (*Fr.* 12, 212, 214)

FIAT 1313, 2, 365

FIAT 764 — Chromoxanreinblau B

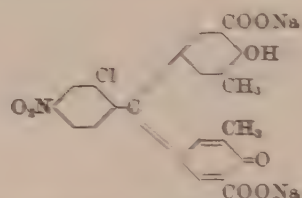
Slightly soluble in cold, soluble in hot water (brownish yellow)

Very slightly soluble in ethanol (yellowish olive brown)

H_2SO_4 conc. — red; on dilution — golden orange

Aqueous solution + NaOH — violet blue

43835 C.I. Mordant Blue 55 (Bright greenish blue)



Condense 2,3-cresotic acid with a nitro-*o*-chlorobenzaldehyde, e.g. 2-chloro-4(or 5)-nitrobenzaldehyde or 2,6-dichloro-3-nitrobenzaldehyde, oxidise the product formed and convert into the sodium salt

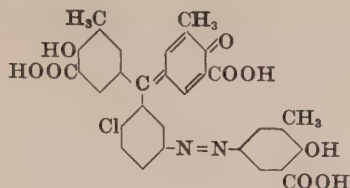
Discoverer — Conzetti 1906

Geigy, *BP* 15204/07; *USP* 877053, 877054; *FP* 384979; *GP* 198909, 199943, 213502, (*Fr.* 9, 201, 204, 207)

Soluble in water (brownish yellow), and less soluble in ethanol

H_2SO_4 conc. — bluish red; on dilution — red ppt.

Aqueous solution + NaOH — violet blue

43840 Mordant Dye

Condense 5-amino-2-chlorobenzaldehyde (1 mol.) with 2,3-cresotic acid (2 mol.), diazotise the product and couple with 2,3-cresotic acid, and oxidise the azo-compound with nitrosylsulfuric acid

Discoverers — A. Hausdörfer and C. Heidenreich 1909

Chromoxane Green GG (By)

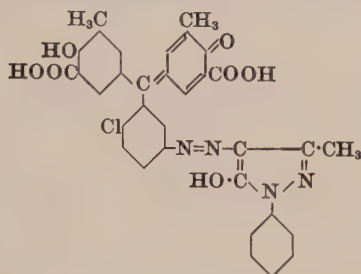
Bayer Co., BP 2394/10; USP 980251, 1021364; FP 413383; GP 223879, 226348 (Fr. 10, 245, 248)

Soluble in water (brown olive yellow)

Soluble in ethanol (wine red)

H₂SO₄ conc. — red orange; on dilution — light orange

Aqueous solution + NaOH — red olive yellow

43845 C.I. Mordant Green 21 (Yellowish green)

Condense 5-amino-2-chlorobenzaldehyde (1 mol.) with 2,3-cresotic acid (2 mol.), diazotise the product, couple with 3-methyl-1-phenyl-5-pyrazolone, and oxidise the azo-compound with nitrosylsulfuric acid

Discoverers — A. Hausdörfer and C. Heidenreich 1909

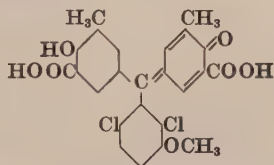
Bayer Co., BP 29751/09, 2394/10; USP 980251, 1021364; FP 413383; GP 223879, 226348 (Fr. 10, 245, 248)

Note — For another example of a Triarylmethane-Pyrazolone Azo dye see C.I.18775

Soluble in water (golden yellow)

Soluble in ethanol (olive yellow brown)

H₂SO₄ conc. — red orange; on dilution — pale golden yellow

43850 Mordant Dye

Condense 2,6-dichloro-3-methoxybenzaldehyde (1 mol.) with 2,3-cresotic acid (2 mol.) and oxidise the product with oxygen-containing gases in presence of copper salts

Discoverer — M. Weiler 1911

Chromoxane Brilliant Blue GM (By)

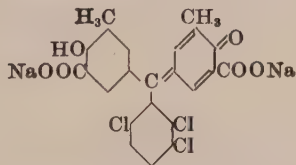
Bayer Co., BP 30105/10, 17129/11; USP 1004609, 1004610; 1044836; FP 404800, 437667; GP 31607; 244826, (Fr. 10, 223, 217)

Soluble in water (olive yellow brown)

Soluble in ethanol (olive yellow brown)

H₂SO₄ conc. — bright magenta red; on dilution — golden orange

Aqueous solution + NaOH — clear violet

43855 C.I. Mordant Blue 47 (Bright blue)

Condense 2,3,6-trichlorobenzaldehyde (1 mol.) with 2,3-cresotic acid (2 mol.) in sulfuric acid, oxidise with nitrous acid, and isolate as sodium salt

Discoverer — Geigy 1906

Geigy, USP 877054; FP 384979; GP 198909, 199943, (Fr. 9, 201, 204)

Cassella Co., GP 363290 (Fr. 14, 725)

FIAT 1313, 2, 366

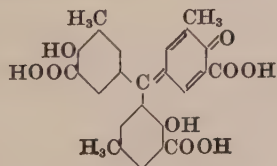
FIAT 764 — Radiochromblau B

Soluble in water (yellow brown)

Soluble in ethanol (yellow brown)

H₂SO₄ conc. — bright magenta red; on dilution — pale golden orange

Aqueous solution + NaOH — violet

43860 C.I. Mordant Violet 27 (Violet)

Condense formaldehyde (1 mol.) with 2,3-cresotic acid (2 mol.), and co-oxidise the product with 2,5-cresotic acid in nitrosylsulfuric acid

Discoverer — M. Weiler 1909

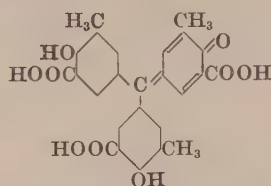
Bayer Co., BP 1411/10; USP 978799, 978801, 978802; FP 415229; GP 230408 (Fr. 10, 226)

Soluble in water (olive)

Soluble in ethanol (red violet)

H₂SO₄ conc. — red orange; on dilution — violet

Aqueous solution + NaOH — magenta to red violet ppt.

43865 C.I. Mordant Violet 16 (Bright reddish violet)

Discoverer — M. Weiler 1908

Bayer Co., BP 14312/09; USP 950359; FP 404800; GP 216924 (Fr. 10, 210)

FIAT 764 — Chromoxanviolett R

(a) Condense 5-formyl-2,3-cresotic acid (1 mol.) with 2,3-cresotic acid (2 mol.), and oxidise the product with nitrosylsulfuric acid

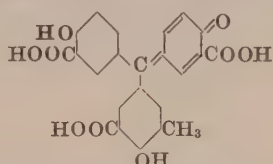
(b) Condense formaldehyde (1 mol.) with 2,3-cresotic acid (2 mol.) and co-oxidise the product with 2,3-cresotic acid in nitrosylsulfuric acid

Soluble in water (light orange red)

Soluble in ethanol (raspberry)

H₂SO₄ conc. — orange; on dilution — orange

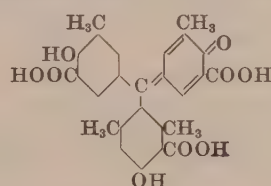
Aqueous solution + NaOH — bright magenta red

43866 C.I. Mordant Violet 17 (Bright reddish violet)

For analogous dyes and preparation method (a) see patents cited under C.I.43865

(a) Condense 5-formyl-2,3-cresotic acid (1 mol.) with salicylic acid (2 mol.), and oxidise the product with nitrosylsulfuric acid

(b) Condense formaldehyde (1 mol.) with salicylic acid (2 mol.) and co-oxidise the product with 2,3-cresotic acid in nitrosylsulfuric acid

43870 C.I. Mordant Violet 33 (Dull bluish violet)

Discoverer — M. Weiler 1910

Bayer Co. BP 11083/11; USP 1034173; FP 436288; GP 243086 (Fr. 10, 230)

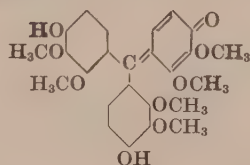
Condense formaldehyde (1 mol.) with 2,3-cresotic acid (2 mol.), and co-oxidise the product with 6-hydroxy-2,4-xylic acid in nitrosylsulfuric acid

Soluble in water (wine red)

Soluble in ethanol (wine red)

H₂SO₄ conc. — bright magenta red; on dilution — red orange

Aqueous solution + NaOH — wine red

43875 Acid Dye

Discoverers — Reichenbach 1835; Grätzel 1876

Pittacal, Eupittone, Eupittonic Acid

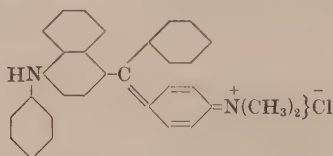
Dyes wool and silk in presence of acid to an orange shade

Reichenbach, *Berzelius' Jahresber.* **14** (1835), 385Grätzel, *Z. Chem. Grossgew.* (1876), 204; *Wagner's Jahresber.* **23** (1877), 940; *Ber.* **11** (1878), 2085Liebermann, *Ber.* **9** (1876), 334; **11** (1878), 1104A. W. Hofmann, *Ber.* **11** (1878), 1455; **12** (1879), 1371, 2216Liebermann & Wiedermann, *Ber.* **34** (1901), 1031Heat a mixture of the sodium salts of 2,3-dimethoxyphenol and 2,3-dimethoxy-*p*-cresol with a little sodium hydroxide at 200–220°C in presence of acid

Soluble in ethanol (brown)

H₂SO₄ conc. — red turned to blue on heating through formation of **Eupittone Black** (hexahydroxyaurine)

Aqueous solution + NaOH — blue

(e) Derivatives of Diphenyl-naphthylmethane**44000 Basic Dye**

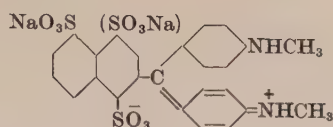
Discoverer — M.L.B.

New Green (MLB)

Used as a yellowish green in calico printing

M.L.B., FP 181351; GP 41751 (Fr. 1, 44)

Condense α,α -dichloro-*N,N*-dimethyl- α -phenyl-*p*-toluidine with *N*-phenyl-1-naphthylamine, and oxidise the product

44005 Acid Dye

Oxidise **C.I.44020** with chromic acid in sulfuric acid solution whereby one or two methyl groups are split off

Discoverer — O. Nastvogel 1897

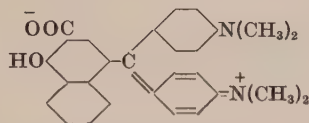
New Patent Blue 4B (By)

Bayer Co., *BP* 15478/97; *USP* 605119; *FP* 263999 (Combined Pat.); *GP* 95830, 97286, (*Fr.* 5, 43, 202)

Very soluble in water (pure blue)

Very soluble in ethanol (pure blue)

H₂SO₄ conc. — pale brownish yellow; on dilution — chrome green to yellow green

44010 Mordant Dye

Condense 4,4'-bis(dimethylamino)benzhydrol with 1-hydroxy-2-naphthoic acid, and oxidise the product

Discoverer — Runkel 1890

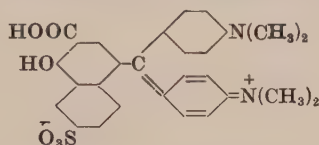
Chrome Blue R (By)

Bayer Co., *BP* 14621/90; *USP* 476413, 476414; *FP* 208330; *GP* 58483 (*Fr.* 3, 120)

Soluble in water (blue)

Slightly soluble in ethanol (blue)

H₂SO₄ conc. — dark bordeaux red; on dilution — reddish brown

44015 C.I. Mordant Violet 18 (Bright violet)

Condense 4,4'-bis(dimethylamino)benzhydrol with 1-hydroxy-7-sulfo-2-naphthoic acid, and oxidise the product with manganese dioxide in acetic-hydrochloric acid

Discoverer — M. Weiler 1922

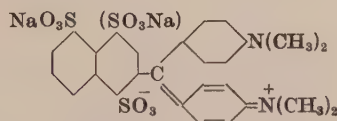
Bayer Co., *BP* 234569; *USP* 1503177; *GP* 406538 (*Fr.* 14, 730)
FIAT 764 — Chromoxanazurol BD

Soluble in water (cornflower blue)

Soluble in ethanol (violet)

H₂SO₄ conc. — red violet; on dilution — orange brown

Aqueous solution + NaOH — violet

44020 Acid Dye

Condense 4,4'-bis(dimethylamino)benzhydrol with 4(or 5)-amino-1-naphthalenesulfonic acid, replace the amino- by the sulfonic acid group, oxidise the product and convert into the sodium salt

Discoverer — Nastvogel 1897

New Patent Blue B, G (By)

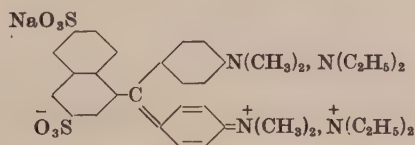
Bayer Co., *BP* 15478/97; *USP* 605119; *FP* addn. to 263999; *GP* 97286 (*Fr.* 5, 202)
Erdmann, *Chem. Ind.* (1900), No. 31
Holmes, *Ind. Eng. Chem.* 15 (1923), 833; cf. *JSDC*, 39 (1923), 354

Very soluble in water (pure blue)

Soluble in ethanol (pure blue)

H₂SO₄ conc. — brown olive yellow; on dilution — brown to green and then to blue

Aqueous solution + NaOH — bluish green cold, reddish violet hot

44025 C.I. Acid Green 16 (Green)

Condense 4,4'-bis(dimethylamino)benzhydrol* with 2,7-naphthalenedisulfonic acid in 15% sulfuric acid, oxidise with lead peroxide and convert into the sodium salt

* Yellower hues are obtained with 4,4'-bis(diethylamino)benzhydrol

Discoverer — Hermann 1899

M.L.B., *BP* 21596/98, 21839/98; *USP* 628243, 630224, 639976, 639977; *FP* 282128 and addns, 282271; *GP* 108129, 110086, 111506, (*Fr.* 5, 196, 199, 198)

Geigy, *GP* 169929 (*Fr.* 8, 195)

BIOS 1433, 49

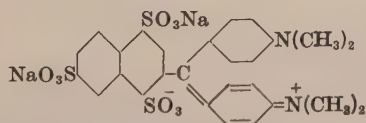
FIAT 764 — Naphtalingruen V

F. Frisch, *Helv. Chim. Acta*, 14 (1931), 669

Soluble in water (bluish green)

Soluble in ethanol (green)

H₂SO₄ conc. — yellowish brown; on dilution — yellow

44030 Acid Dye

Preparation as for **C.I.44020** with 4-amino-1,6-naphthalenedisulfonic acid instead of 5-amino-1-naphthalenesulfonic acid

Discoverer — O. Nastvogel 1897

New Patent Blue GA (By)

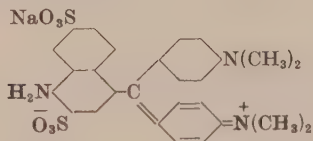
Bayer Co., *BP* 15478/97; *USP* 605119; *FP* 263999 (Combined Pat.); *GP* 95830, 97286, (*Fr.* 5, 43, 202)

Very soluble in water (pure blue)

Slightly soluble in ethanol (pure blue)

H₂SO₄ conc. — pale brownish yellow; on dilution — chrome green to yellow green

Aqueous solution + NaOH — violet blue grey with ppt.

44035 Acid Dye

(a) Condense 4,4'-bis(dimethylamino)benzhydrol with 1-amino-2,7-naphthalenedisulfonic acid, oxidise the product and convert into the sodium salt

(b) Condense 4,4'-bis(dimethylamino)benzhydrol with 1-amino-2-naphthalenesulfonic acid, sulfonate the product with 34% oleum at 20°C, oxidise and convert into the sodium salt

Discoverer — Kothe 1892

Acid Fast Blue B (By)

Bayer Co., *BP* 14728/92, 19246/92, 21139/92; *FP* 225980; *GP* 76073, 80510, (*Fr.* 4, 209, 210)
JSDC, 9 (1893), 160; 14 (1898), 230

Very soluble in water (bluish violet)

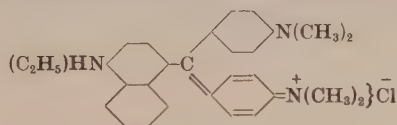
Very soluble in ethanol (blue)

H₂SO₄ conc. — brown; on dilution — blue

44040 C.I. Basic Blue 11 (Bright reddish blue)

44040:1 (C.I. Solvent Blue 6) is the free base

44040:2 (C.I. Pigment Blue 10 and 11) are the phosphomolybdic, phosphotungstic, and phosphotungstomolybdic acid salts



(a) Condense 4,4'-bis(dimethylamino)benzhydrol with *N*-ethyl-1-naphthylamine, convert the product into the *N*-nitroso derivative, oxidise, and remove the nitroso group

(b) Condense *p,p'*-(dichloromethylene)bis[*N,N*-dimethylaniline] with *N*-ethyl-1-naphthylamine

Discoverers — Nastvogel and Reingruber 1892

Bayer Co., *BP* 19062A/91; *USP* 517473; *FP* 217020

BIOS 959, 16; *FIAT* 1313, 2, 327-8

FIAT 764 — Viktoriablau R

Nölting & Philipp, *Ber.* 41 (1908), 583

Slightly soluble in cold, soluble in hot water (blue)

Very soluble in ethanol (blue)

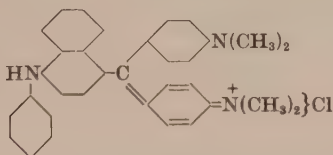
H₂SO₄ conc. — brownish yellow; on dilution — light green to blue

Aqueous solution + NaOH — brown flocculent ppt.

44045 C.I. Basic Blue 26 (Bright blue)

44045:1 (C.I. Solvent Blue 4) is the free base

44045:2 (C.I. Pigment Blue 2) is the phosphotungstomolybdic acid salt



(a) Condense *p,p'*-(dichloromethylene)bis[*N,N*-dimethylaniline] with *N*-phenyl-1-naphthylamine

(b) Condense 4,4'-bis(dimethylamino)benzhydrol with *N*-phenyl-1-naphthylamine, convert the product to the *N*-nitroso derivative, oxidise, and remove the nitroso group

Discoverers — Caro and Kern 1883

Badische Co., *BP* 5038/84, 11159/84, 12022/86; *USP* 297413, 297414; *FP* 160090; *GP* 27789, 29962, (*Fr.* 1, 80, 86)

Bayer Co., *BP* 19062A/91; *USP* 496435

BIOS 959, 15. *FIAT* 1313, 2, 321-323

FIAT 764 — Viktoriablau B, base B

Nathansohn & Müller, *Ber.* 22 (1889), 1888

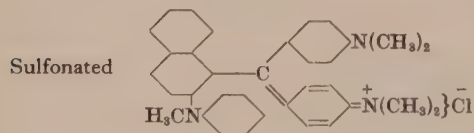
Note — The *N*-methylated dye (obtained with *N*-methyl-*N*-phenyl-1-naphthylamine instead of *N*-phenyl-1-naphthylamine) is **Victoria Blue 4R** — see C.I.42563

Soluble in cold and hot water (blue)

Soluble in ethanol (blue)

H₂SO₄ conc. — reddish brown; on dilution — yellow to green and then to blue

Aqueous solution + NaOH — dark reddish brown ppt.

44055 C.I. Acid Violet 24 (Bright bluish violet)

Condense *p,p'*-(dichloromethylene)bis[*N,N*-dimethylaniline] with an *N*-methyl(or other alkyl)-*N*-phenyl-2-naphthylamine and sulfonate with monohydrate or oleum

Discoverer — Steiner 1895

Sandoz, *BP* 30015/96; *USP* 603016; *FP* 257887; *GP* 96402 (*Fr.* 5, 184)

Soluble in water (violet)

Soluble in ethanol (violet)

H₂SO₄ conc. — yellowish brown; on dilution — green and then blue

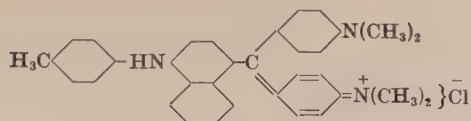
Aqueous solution + NaOH — blue

44060 C.I. Acid Blue 88 (Reddish blue)

Discoverer — I.G.

BIOS 959, 18

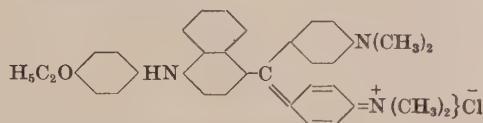
Disulfonated



Condense 4,4'-bis(dimethylamino)benzophenone with *N*-*p*-tolyl-1-naphthylamine in toluene with phosphorus oxychloride and disulfonate with 65% oleum

44065 Solvent Dye**Ceres Blue I (IG)**

BIOS 959, 18; 1433, 68 and 71; 1661, 22



Condense 4,4'-bis(dimethylamino)benzophenone with *N*-*p*-phenetyl-1-naphthylamine in toluene with phosphorus oxychloride

44070 Pigment

Discoverer — I.G.

Fanal Blue 3B supra (IG)

Used as a pigment for printing inks

BIOS 959, 18; 1433, 71, 110

FIAT 764 — Fanalblau 3B Supra

Phosphotungstomolybdic acid salt of **C.I.44065****44075 C.I. Acid Blue 86 (Blue)**

Discoverer — I.G.

BIOS 959, 18; 1433, 68

FIAT 764 — Brillantwollblau G ex.

Disulfonic acid of **C.I.44065**

Very soluble in water (blue)

Slightly soluble in ethanol (blue)

H₂SO₄ conc. — blood red; on dilution — deep green

Aqueous solution + NaOH — grey

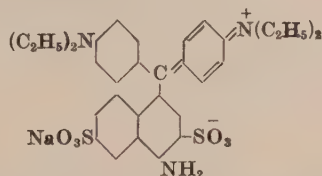
44080 C.I. Acid Blue 108 (Blue)

Discoverer — I.G.

Cyanol Silk Blue B (IG)

BIOS 1433, 43

FIAT 764 — Cyanolseidenblau B



Sulfonate Cleve's acid (8-amino-2-naphthalenesulfonic acid) with 65% oleum, condense in sulfuric acid with *p,p'*-methylenebis[*N,N*-diethylaniline] and oxidise with manganese dioxide

Soluble in water (blue)

44085 C.I. Basic Blue 15 (Blue)

Discoverers — Caro and Kern 1883

Badische Co., BP 5038/84, 11159/84, 12022/86; USP 297413, 297414; FP 160090; GP 27789, 29962, (Fr. 1, 80, 86)

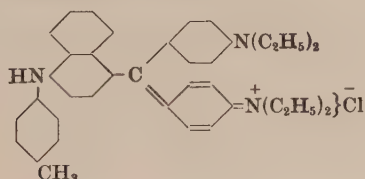
JSDC, 1 (1885), 250

Rawsch, JSDC, 4 (1888), 82

Seyewetz, Rev. gén. mat. col. 5 (1901), 44

Biltz & Vegesack, Z. phys. Chem. 73 (1910), 493

von Hahn, Koll. Z. 34 (1924), 162



Condense *p,p'*-(dichloromethylene)bis[*N,N*-diethylaniline] with *N*-*p*-tolyl-1-naphthylamine

Soluble in water (bluish violet)

Readily soluble in ethanol (violet)

H₂SO₄ conc. — yellow brown; on dilution — green and then blue

Aqueous solution + NaOH — pale reddish brown ppt.

44090 C.I. Acid Green 50 (Bluish green)

Discoverer — Badische Co. 1883

Ewer & Pick, GP 31321 (Fr. 1, 90)

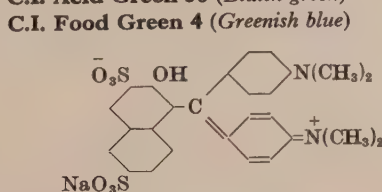
Bayer Co., BP 14621/90; FP 208330; GP 58483 (Fr. 3, 120)

FIAT 1313, 2, 350

FIAT 764 — Wollgruen S

JSDC, 9 (1893), 77

Calcott & English, Ind. Eng. Chem. 15 (1923), 1042



(a) Condense *p,p'*-(dichloromethylene)bis[*N,N*-dimethylaniline] with 2-naphthol, sulfonate with oleum, and convert into the sodium salt

(b) Condense 4,4'-bis(dimethylamino)benzhydrol with 2-naphthol-3,6(or 6,8)-disulfonic acid, oxidise the product and convert into the sodium salt

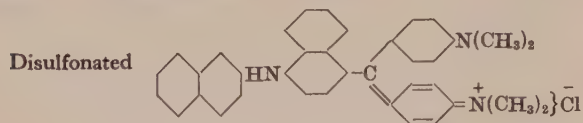
Standard

BS 4153 (1967), Green 5 for use in foodstuffs, Metric units

Soluble in cold, very soluble in hot water (green blue)

Soluble in ethanol (turquoise blue)

H₂SO₄ conc. — orange; on dilution — greenish amber

44095 C.I. Acid Blue 97 (Bright blue)

Condense 4,4'-bis(dimethylamino)benzophenone with *N*-2-naphthyl-1-naphthylamine in toluene with phosphorus oxychloride, disulfonate the product with oleum and convert to the sodium salt

Discoverer — Steiner 1895

Wool Blue G Extra (IG)

Sandoz, *BP* 30015/96; *USP* 603016; *FP* 257887; *GP* 96402 (*Fr.* 5, 184)

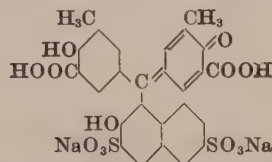
BIOS 959, 18, No. 63

FIAT 764 — Wollblau G ex.

Soluble in water (blue)

Soluble in ethanol (blue)

H₂SO₄ conc. — reddish brown; on dilution — bluish green

44100 C.I. Mordant Blue 42 (Bright navy)

Condense formaldehyde with 2,3-cresotic acid, and co-oxidise the product in nitrosylsulfuric acid with R acid (2-naphthol-3,6-disulfonic acid)

Discoverer — M. Weiler 1910

BP 1411/10; *USP* 978799, 978801, 978802; *FP* 415229; *GP* 230408 (*Fr.* 10, 226)

BIOS 1433, 122

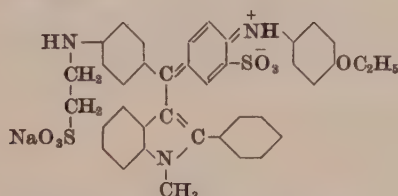
FIAT 764 — Chromoxanazurolblau R, RD

Very soluble in water (wine red)

Very soluble in ethanol (wine red)

H₂SO₄ conc. — dark violet; on dilution — wine red

Aqueous solution + NaOH — clear violet

(f) Miscellaneous Triarylmethane derivatives**44500 Acid Dye**

Condense dichloro(*p*-chlorophenyl)phenylmethane with 1-methyl-2-phenylindole, then condense with taurine and *p*-phenetidine, with subsequent sulfonation and oxidation

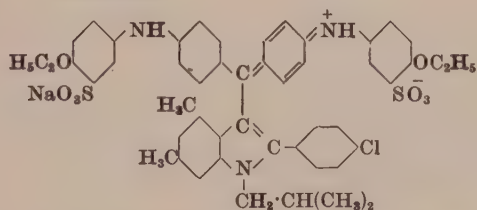
Discoverer — I.G.

Wool Fast Violet FB (IG)

BIOS 959, 86-95

FIAT 1313, 2, 336

FIAT 764 — Wollechtviolett FB

44505 Acid Dye

Condense 4,4'-dichlorobenzophenone with 2-(*p*-chlorophenyl)-1-isobutyl-4,6-dimethylindole and phosphorus oxychloride, then react with *p*-phenetidine and disulfonate

Discoverer — P. Wolff 1932

Wool Fast Blue FGL (IG)

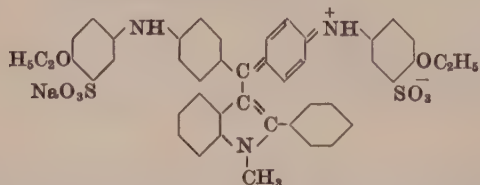
Dyes wool in presence of acetic, formic, or sulfuric acid, and is suitable also for silk

Fastness Properties (C): Alkali 2-3, Light 4-5, Milling 4, Perspiration 4, Washing 4. The fastness properties are similar on unweighted silk

I.G., *BP* 417014; *USP* 2032033; *GP* 604429 (*Fr.* 21, 787)

FIAT 1313, 2, 335

FIAT 764 — Wollechtblau FGL

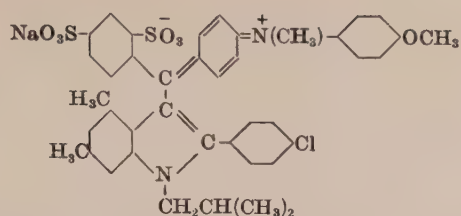
44510 C.I. Acid Blue 123 (Blue)

Condense 4,4'-dichlorobenzophenone with 1-methyl-2-phenylindole and phosphorus oxychloride, then react the product with *p*-phenetidine and disulfonate

Discoverer — P. Wolff 1932

I.G., *BP* 417014; *USP* 2032033; *GP* 604429 (*Fr.* 21, 787)

FIAT 1313, 2, 334

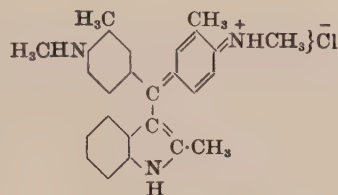
44515★ Acid Dye

Condense dichloro(*p*-chlorophenyl)phenylmethane with 2-(*p*-chlorophenyl)-1-isobutyl-4,6-dimethylindole, and then condense the product with *N*-methyl-*p*-anisidine with subsequent disulfonation

Discoverer — I.G.

Wool Fast Green FG (IG)

FIAT 1313, 2, 360

44520★ Basic Dye

(a) Condense Auramine G (C.I.41005) with 2-methylindole in hydrochloric acid solution

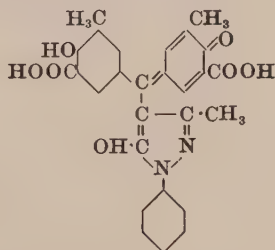
(b) Condense 3,3'-dimethyl-4,4'-bis(methylamino)benzhydrol with 2-methylindole, and oxidise the product with ferric chloride in hydrochloric acid solution

Discoverer — F. Runkel 1901

Brilliant Rhoduline Violet R (By)

Bayer Co., BP 2913/01; USP 677279; FP 308033; GP 121837 (Fr. 6, 235)

BIOS 959, 3, No. 11

44525 C.I. Mordant Brown 26 (Reddish brown)

Condense formaldehyde with 2,3-cresotic acid, then co-oxidise the product with 3-methyl-1-phenyl-5-pyrazolone in nitrous acid

Discoverer — M. Weiler 1909

Bayer Co., BP 6364/10, 26677/10; USP 1023977; FP 419902; GP 230410 (Fr. 10, 229)

BIOS 1433, 124. FIAT 1313, 2, 358, 367

FIAT 764 — Chromoxanbraun 5R

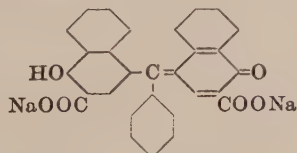
GP 355115

Soluble in water (golden orange)

Soluble in ethanol (red orange brown)

H₂SO₄ conc. — orange; on dilution — golden yellow

Aqueous solution + NaOH — magenta red

44530 C.I. Mordant Green 31 (Green)

Condense benzotrichloride (1 mol.) with 1-hydroxy-2-naphthoic acid (2 mol.) in aqueous sodium hydroxide in presence of copper

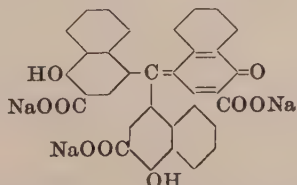
Discoverers — G. de Montmollin, J. Spieler, and G. Bonhôte 1921

Ciba, BP 191854; USP 1460315; FP 542720; Sw.P 92406;

GP 355115

Soluble in water (yellow brown)

H₂SO₄ conc. — blue; on dilution — green with brown red ppt.

44535 C.I. Mordant Blue 28 (Bright blue → Reddish navy)

React carbon tetrachloride with 1-hydroxy-2-naphthoic acid in aqueous sodium hydroxide solution in the presence of copper

Discoverers — G. de Montmollin and J. Spieler 1919


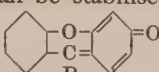
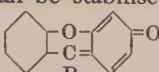
Ciba, BP 172177; USP 1387596; FP 525598; Sw.P 91774

Soluble in water (blue violet)

H₂SO₄ conc. — pure blue; on dilution — violet ppt.

NOTES

XANTHENE COLOURING MATTERS

The chromophore of the aminoxanthene dyes is the resonance-hybrid  \longleftrightarrow , where R = H, or alkyl, or aryl; the hydroxyxanthenes can be stabilised by the loss of a proton, forming an uncharged system in which the chromophore is the quinoid structure 

The dyes are prepared from xanthene derivatives with the usual auxochromes in *para*-position to the methane carbon atom. These derivatives are not obtained from xanthene itself, but by reacting together suitably chosen simple intermediates.

When R is an aryl radical, the dyes, although possessing the pyrone ring, have analogies with the triarylmethane class.

The xanthene class is subdivided into amino, aminohydroxy, and hydroxy derivatives.

In general, the xanthenes are basic dyes which possess remarkably pure bright hues, and their solutions are strongly fluorescent. They dye wool and silk directly from weak acid baths, and cotton on a tannin mordant. Some of the hydroxy compounds are valuable mordant dyes.

Special Literature

Hewitt, *Dyestuffs derived from Pyridine, Quinoline, Acridine, and Xanthene*, Longmans, Green & Co, London, 1922

Fierz-David, *Künstliche Organische Farbstoffe*, Julius Springer, Berlin, 1926

Elderfield, *Heterocyclic Compounds*, Vol. 2, p. 419, John Wiley & Sons, New York, 1951

Venkataraman, *The Chemistry of the Synthetic Dyes*, p. 740, Academic Press, New York, 1952

Lubs, *The Chemistry of Synthetic Dyes and Pigments*, p. 291, Reinhold Publishing Corporation, New York, 1955

XANTHENE COLOURING MATTERS

(I) — AMINO-DERIVATIVES (FLUORENE COLOURING MATTERS)

(a) Pyronines (C.I.45000–45020)

(d) Rosamines (C.I.45090–45105)

(b) Succineins (C.I.45050)

(e) Rhodamines (C.I.45150–45225)

(c) Sacchareins (C.I.45070)

(II) — AMINO-HYDROXY-DERIVATIVES (RHODOLS)

(III) — HYDROXY-DERIVATIVES (FLUORONE COLOURING MATTERS)

(a) Hydroxy-phthaleins (C.I.45350–45460)

(b) Anthrahydroxy-phthaleins (C.I.45500–45510)

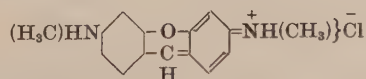
(IV) — MISCELLANEOUS-DERIVATIVES

(I) — AMINO-DERIVATIVES (FLUORENE COLOURING MATTERS)

(a) PYRONINES

45000

Basic Dye



Oxidise **C.I.45005** with potassium permanganate

Discoverers — Bender and Kämmerer 1891

Acridine Red 3B

Leonhardt Co., *BP* 1231/92; *USP* 489625; *FP* 219023; *GP* 65282

(*Fr.* 3, 176)

Biehringer, *J. prakt. Chem.* **54** (1896), 235

Soluble in water (red with greenish yellow fluorescence)

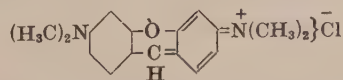
Soluble in ethanol (red with greenish yellow fluorescence)

H₂SO₄ conc. — yellow with green fluorescence; on dilution — orange then red

Aqueous solution + NaOH — red ppt.

45005

Basic Dye



Condense *m*-dimethylaminophenol with formaldehyde, dehydrate the product with sulfuric acid and oxidise with ferric chloride

Discoverer — Bender 1889

Pyronine G (By)

Bayer Co., *BP* 8673/89; *FP* 198785; *GP* 54190 (*Fr.* 2, 61)

Leonhardt Co., *BP* 13217/89, 18606/91; *USP* 445684; *FP* 200401;

GP 58955, 59003, 63081, (*Fr.* 3, 92, 94, 93)

Gerber Co., *GP* 60505 (*Fr.* 3, 96)

BIOS 959, 10

Monit. sci. **4** [4] (1890), 751

Möhlán & Koch, *Ber.* **27** (1894), 2896

Biehringer, *Ber.* **27** (1894), 3299; *J. prakt. Chem.* **54** (1896), 217

Scott & French, *The Military Surgeon*, Nov. 1924

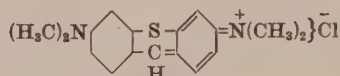
Soluble in water (red with yellow fluorescence)

Soluble in ethanol (red with yellow fluorescence)

H₂SO₄ conc. — reddish yellow; on dilution — red
Aqueous solution + HCl — bright orange

45006

Basic Dye (Bluish red)



Heat *p,p'*-methylenebis[*N,N*-dimethylaniline] with flowers of sulfur in 25% oleum, and convert the sulfate to the chloride

Discoverer — Sandmeyer

Methylene Red (Gy)

Geigy, *GP* 65739 (*Fr.* 3, 97)Kehrmann & Löwy, *Ber.* 45 (1912), 290

Soluble in water (blue red and brick red fluorescence)

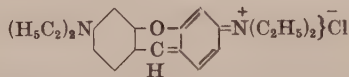
 H_2SO_4 conc. — orange; on dilution — blue red

Aqueous solution + NaOH — decolorised

Very similar in properties and usage to **C.I.45005**

45010

Basic Dye



Condense *m*-diethylaminophenol with formaldehyde and proceed as for **C.I.45005**

Discoverer — Bender 1889

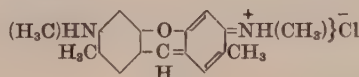
Pyronine B (By)

Bayer Co., *BP* 8673/89; *FP* 198785; *GP* 54190 (*Fr.* 2, 61)Leonhardt Co., *BP* 13217/89, 18606/91; *FP* 200401; *GP* 58955, 59003, 63081, (*Fr.* 3, 92, 94, 93)*Monit. sci.* 4 [4] (1890), 751Biehringer, *Ber.* 27 (1894), 3299; *J. prakt. Chem.* 54 (1896), 217Scott & French, *The Military Surgeon*, November 1924

Solubilities, reactions, and uses similar to those of **C.I.45005**, except for a redder fluorescence and a bluer shade

45015

Basic Dye



Condense 3-methylamino-*p*-cresol with formaldehyde in concentrated sulfuric acid and oxidise with ferric chloride

Discoverer — Nastvogel 1902

Rhodamine Scarlet G (By)

FDX 885 — Rhodamin Scharlach G

Patents as for **C.I. 45105**

Soluble in water and ethanol (orange red with strong yellow green fluorescence)

 H_2SO_4 conc. — light citron yellow; on dilution — orange

Aqueous solution + NaOH — decolorised to faint pink

45020

Basic Dye

Probably a dye of the Pyronine type

Heat *m*-diethylaminophenol with chloral in glacial acetic acid containing disodium arsenate and crystalline sodium acetate for 4 hours at 100°C

Discoverer — Ville 1901

Urbine E

Dyes tannin-mordanted cotton dull bluish red

Ville, *BP* 19721/01; *USP* 701427; *FP* 308968; *GP ap.* V4204 (*Fr.* 6, 283)Cf. Badische Co., *BP* 15859/84; *USP* 625641; *FP* 240216; *GP* 81042 (*Fr.* 4, 177)

Soluble in water and ethanol (cherry red with yellowish orange fluorescence)

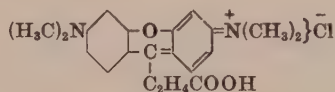
HCl conc. — blue violet

(b) SUCCINEÏNS

45050

C.I. Basic Red 11 (Pink)

Zinc double chloride compound of



(a) Fuse *m*-dimethyl(or diethyl)aminophenol with succinic anhydride (*BP* 2635/89)

(b) React dimethylamine with resorcinol-succineïn at 170–200°C under pressure (*BP* 10047/90)

Discoverers — Kahn and Majert 1888

Ciba, *BP* 2635/89, 10047/90, 7298/92; *FP* 195930; *GP* 54997 (*Fr.* 2, 88), 66238, 71490, (*Fr.* 3, 177, 179)Bayer Co., *FP* 194908; *GP* 51983 (*Fr.* 2, 86)Gnehm, *USP* 402436, 425504*BIOS* 959, 15*Färberztg.* 26 (1890), 267Dutt & Thorpe, *JCS*, 125 (1924), 2524

Soluble in water (red with yellow fluorescence)

Slightly soluble in ethanol (intense yellow fluorescence)

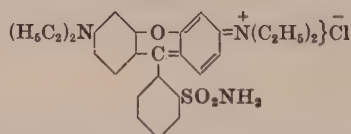
 H_2SO_4 conc. — brownish yellow (strong green fluorescence); on dilution — rose red

Aqueous solution + NaOH — slowly decolorised

(c) SACCHAREÏNS

45070

Basic Dye



Condense *m*-diethylaminophenol with saccharin at about 165°C

Discoverer — Koetschet 1896

Saccharine (Mo)

Dyes tannin-aluminium mordanted cotton pink

Usines du Rhône, *BP* 21197/96; *FP* 267442; *GP* 100779 (*Fr.* 5, 233)Monnet & Koetschet, *Bull. Soc. chim.* 17 (1897), 690, 1030

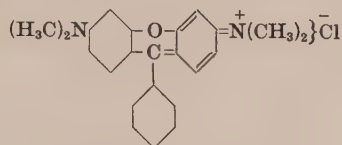
Soluble in water and ethanol (reddish violet)

Aqueous solution + HCl conc. — brown

Aqueous solution + NaOH — decolorised with ppt. of colour base

(d) ROSAMINES

45090 Basic Dye



(a) Condense *m*-dimethylaminophenol with α,α,α -trichlorotoluene (benzotrichloride) — (Heumann and Rey)

(b) Condense benzaldehyde with *m*-dimethylaminophenol, dehydrate the product with sulfuric acid, and oxidise with ferric chloride — (GP 62574)

Discoverers — Heumann and Rey 1889

Rosamine, Rosindamine or Benzorhodamine

Dyes tannin-mordanted cotton dull bluish red

M.L.B., *FP* 200347; *GP* 51348 (*Fr.* 2, 64)

Bayer Co., *BP* 8673/89; *FP* 198785; *GP ap.* F 4097, 62574, (*Fr.* 2, 66, 98)

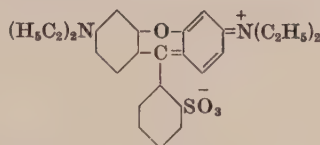
Badische Co., *GP* 69074 (*Fr.* 3, 169)

Soluble in water and ethanol (bluish red with bright yellowish red fluorescence)

H_2SO_4 conc. — orange yellow; on dilution — red

Aqueous solution + NaOH — bluer and less fluorescent

45095 Acid Dye



(a) React **C.I.45070** with 70% sulfuric acid at 125–130°C — (*BP* 18017/97)

(b) Condense *o*-formylbenzenesulfonic acid with *m*-diethylaminophenol, dehydrate the product with sulfuric acid and oxidise with ferric chloride

Discoverer — Koetschet 1896

Sulphurëin (Mo)

Dyes wool and silk from a neutral bath

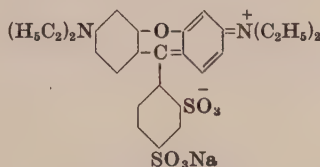
Usines du Rhône, *BP* 21196/96, 21197/96, 18017/97; *FP* 267442; *GP* 100779, 100780, (*Fr.* 5, 233, 235)

Geigy, *GP* 90487 (*Fr.* 4, 258)

Soluble in water and ethanol (bluish red with yellowish red fluorescence)

H_2SO_4 conc. — yellowish red; on dilution — bluish red

45100 C.I. Acid Red 52 (Bright bluish pink)



Condense 4-formyl-*m*-benzenedisulfonic acid with *m*-diethylaminophenol, dehydrate the product with sulfuric acid, oxidise with ferric chloride and convert to the sodium salt

Discoverer — Emmerich 1906

M.L.B., *USP* 1003738; *GP* 205758 (*Fr.* 9, 216), 229466 (*Fr.* 10 244)

BIOS 959, 66

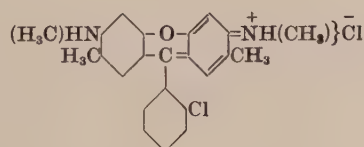
FIAT 764 — Sulforhodamin B

Soluble in water and ethanol (bluish red with a yellow fluorescence)

H_2SO_4 conc. — orange yellow; on dilution — red

Aqueous solution + NaOH — bluish red

45105 Basic Dye



Condense *o*-chlorobenzaldehyde with 3-methylamino-*p*-cresol sulfate, dehydrate the product with sulfuric acid, and oxidise with ferric chloride

Discoverer — Nastvogel 1902

Rhodamine 5G (By)

Hue and dyeing properties similar to **C.I.45160**

Bayer Co., *BP* 13192/03; *USP* 738227; *FP* 332926; *GP* 150440 (*Fr.* 7, 144)

Soluble in water and ethanol (red with a yellow fluorescence)

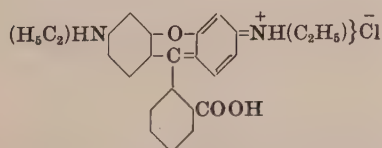
H_2SO_4 conc. — golden yellow; on dilution — orange red to pink ppt.

Aqueous solution + HCl — magenta with light yellow green fluorescence and ppt.

(e) RHODAMINES

45150 C.I. Basic Red 8 (Bright red → Bright bluish red)

45150:1 (C.I. Pigment Red 82) is the phosphotungstomolybdc acid salt



Heat equal weights of **C.I.45170** and aniline hydrochloride at 185–190°C for about 1½–2 hours

Discoverer — Cérésolé 1891

Badische Co., *BP* 14723/91; *USP* 516588, 516589; *FP* 215700; *GP* 63325 (*Fr.* 3, 175)

Soluble in water and ethanol (reddish violet with red fluorescence)

H_2SO_4 conc. — pale yellow; on dilution — red fluorescent solution

Aqueous solution + HCl — yellow

45155 Acid Dye

Sodium salt of a sulfonated Rhodamine, e.g. Rhodamine G (C.I.45150)

Note — It is uncertain whether the sulfonic acid group enters the phthalic acid radical or one of the other nuclei

Discoverers — Boedeker and C. Hoffmann 1898

Fast Acid Eosine G (MLB), Fast Acid Phloxine A (MLB)

Dyes wool in presence of sulfuric acid and silk in presence of acetic or sulfuric acid

Fastness Properties (C): Alkali 3-4, Alkaline Milling 2-3, Light 2-3, Perspiration 2-3, Sea Water 2-3, Washing 2-3, 2-3, 3

M.L.B., BP 2999/96; USP 642893; FP 253812; GP 87977 (Fr. 4, 248)

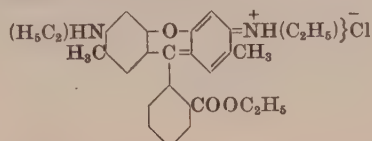
Chem. Ind. (1900), 9

Soluble in water (yellowish red with a strong green fluorescence)
H₂SO₄ conc. — yellow with a faint green fluorescence; on dilution — reddish yellow, then pink with a green fluorescence
Aqueous solution + NaOH — dark red with a strong dark green fluorescence

45160 C.I. Basic Red 1 (Bright bluish pink)

45160:1 (C.I. Pigment Red 81) is the phosphotungstomolybdic acid salt

45160:2 (C.I. Pigment Red 169) is a copper ferrocyanide complex
See also C.I. Solvent Red 36



Condense 3-ethylamino-*p*-cresol with phthalic anhydride, and esterify the product with ethanol and a mineral acid

Note — The former use of *m*-ethylaminophenol has now been superseded as above

Discoverers — Bernthsen 1892; Schmid and Rey 1892

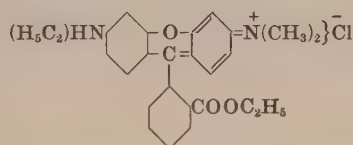
Badische Co., BP 9633/92; USP 516584; FP 225341; GP 73573, 73880, (Fr. 3, 183, 184)

BIOS 959, 12, 37

FIAT 764 — Rhodamin 6G

Bernthsen, *Chem. Ztg.* **16** (1892), 1956

Soluble in water (scarlet red with a greenish fluorescence)
Soluble in ethanol (red with a yellow fluorescence)
H₂SO₄ conc. — yellow; on dilution — red
Aqueous solution + NaOH — red ppt.

45165 Basic Dye

Condense *m*-dimethylaminophenol (1 mol.) with phthalic anhydride (1 mol.), then condense the product with *m*-ethylaminophenol and ethylate

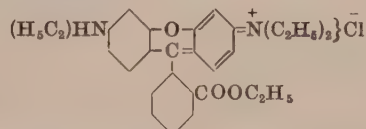
Discoverer — Müller 1895

Rhodine 2G (SCI)

Dyes a brilliant red on tannin-mordanted cotton

Chem. Fabr. Bindschedler, Basle, BP 4985/95; USP 584119; FP 245593; GP 85931, 87068, ap. B16962, B17374, (Fr. 4, 260, 262, 262, 263)

Soluble in water (crimson red)
Soluble in ethanol (scarlet red with a green fluorescence)
H₂SO₄ conc. — yellow; on dilution — red
Aqueous solution + NaOH — scarlet red ppt.

45166 Basic Dye

Condense *m*-diethylaminophenol (1 mol.) with phthalic anhydride (1 mol.), then condense the product with *m*-ethylaminophenol and ethylate

Discoverer — Müller 1895

Rhodamine 4G (IG)

Brown & Mason, JCS (1933), 1264

Patents as for C.I.45165

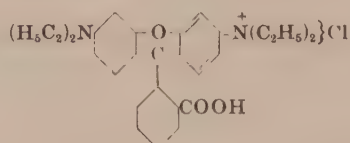
45170 C.I. Basic Violet 10 (Bright reddish violet)

45170:1 (C.I. Solvent Red 49) is the free base

45170:2 (C.I. Pigment Violet 1) is the phosphotungstomolybdic acid salt

45170:3 (C.I. Pigment Red 173) is the aluminium salt

Classical name **Rhodamine B**



(a) Condense *m*-diethylaminophenol with phthalic anhydride
(b) React 3',6'-dichlorofluoran with diethylamine under pressure — (BP 9600/88)

Note — The corresponding methyl derivative is not sufficiently soluble to be of value

Discoverers — Cérésolle 1887; Homolka and Boedeker 1888

Badische Co., BP 15374/87; USP 377349, 377350; FP 186697, 198173; GP 44002 (Fr. 2, 68)

M.L.B., BP 9600/88; FP 192589; GP 54684 (Fr. 2, 86)

Brit. Dye Corp. & Hodgson, BP 205254

BIOS 959, 11, 32

FIAT 764 — Rhodamin B

Weingärtner, *Chem. Ztg.* **11** (1887), 1620

Knecht, JSDC, **4** (1888), 96; **21** (1905), 294

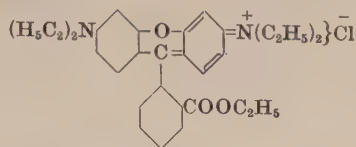
Bernthsen, *Chem. Ztg.* **16** (1892), 1956

Sansone, *Rev. gén. Mat. col.* **28** (1924), 127; **29** (1925), 132, 168; **30** (1926), 135, 168

Yamuda, JSCI (Japan), **29** (1926), 591

Brown & Mason, JCS (1933), 1264

Soluble in water and ethanol (bluish red with strong fluorescence)
Slightly soluble in acetone
Very soluble in Cellosolve
H₂SO₄ conc. — yellowish brown with strong green fluorescence; on dilution — scarlet then to bluish red and orange
Aqueous solution + NaOH — rose red flocculent ppt. on heating

45175 C.I. Basic Violet 11 (Bright reddish violet)**45175:1** (C.I. Pigment Violet 2) is the phosphotungstomolybdic acid salt

Esterification of **Rhodamine B (C.I.45170)** with ethyl chloride, or with ethanol and a mineral acid, or with ethanol at 160–170°C under pressure (GP 73451)

Discoverer — Monnet 1891

Monnet, *BP* 4677/92; *USP* 499927; *FP* 216407Badische Co., *BP* 7298/92; *FP* 225341; *GP* 66238, 71490, 73451, (Fr. 3, 177, 179, 182)*BIOS* 959, 11*FIAT* 764 — Rhodamin 3BMonnet, *Bull. Soc. chim.* 7 (1892), 523Bernthsen, *Chem. Ztg.* 16 (1892), 1956; *Ber.* 26 (1893), 261; 27 (1894), 439**Fanal Red 6BM (IG)**

Pigment for printing inks consisting of the copper ferrocyanide lake of C.I.45175

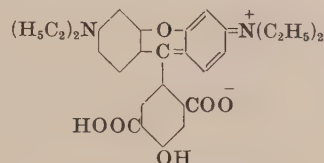
BIOS 961, 29; *BIOS* 1661, 19*FIAT* 764 — Fanalrot 6BM

Soluble in water (violet red with brownish red fluorescence)

Soluble in ethanol (red with vermilion fluorescence)

 H_2SO_4 conc. — greenish yellow; on dilution — red

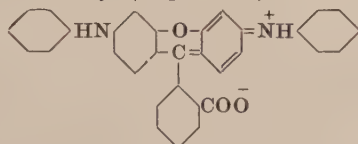
Aqueous solution + HCl — yellow

45180 C.I. Mordant Red 27 (Bluish pink)

Condense 5-hydroxytrimellitic acid and *m*-diethylaminophenol with sulfuric acid in *o*-dichlorobenzene at 170–175°C

Note — The Sodium Salt is **Chromoxane Brilliant Red BD, 3BD extra**

Discoverers — Eckert and Schilling 1936

I.G., *BP* 472757; *USP* 2153059; *GP* 692708*BIOS* 1433, 46, 48.*FIAT* 1313, 2, 353*FIAT* 764 — Chromoxanbrillantrot BL and BD**45185 Solvent Dye (Bright violet)**

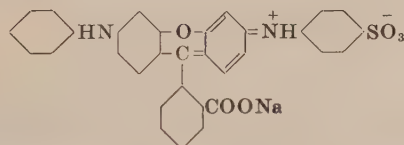
Condense 3',6'-dichlorofluoran with aniline and use the product in the form of the free acid

Discoverer — I.G.

Spirit Fast Violet R (IG)

Solvent dye for use in alcoholic solvents for spirit lacquers and rubber stereo printing inks

Fastness Properties: Light, very good; Heat, stable to 130°C

BIOS 959, 14**45186 C.I. Acid Violet 30 (Violet)**

React aniline with 3',6'-dichlorofluoran and sulfonate the product

Discoverers — Schmid 1888; Boedeker 1888

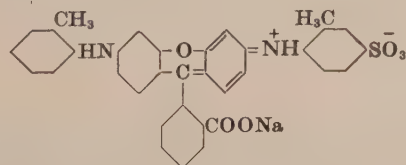
M.L.B., *BP* 9600/88; *FP* 195917, 201660; *GP* 49057 (Fr. 2, 79)Badische Co., *GP* 46807 (Fr. 2, 75)Durand & Huguenin, *BP* 251644*BIOS* 959, 17

Soluble in water (reddish violet)

Slightly soluble in ethanol (reddish violet)

 H_2SO_4 conc. — reddish orange; on dilution — violet with reddish violet ppt.

Aqueous solution + NaOH — cherry red

45190 C.I. Acid Violet 9 (Bright reddish violet)**45190:1** (C.I. Solvent Violet 10) is the free base

Condense *o*-toluidine with 3',6'-dichlorofluoran, sulfonate the base **45190:1** obtained and convert to the sodium salt

Discoverer — Boedeker 1888

M.L.B., *BP* 9600/88; *FP* 195917, 201660; *GP* 44002, 45263, 46354, 46807, 47451, 49057, (Fr. 2, 68, 72, 74, 75, 75, 79)Durand & Huguenin, *BP* 251644*BIOS* 959, 5, 24*FIAT* 764 — Echtsaeureviolett ARR*JSDC*, 6 (1890), 80

Soluble in water (violet red)

Soluble in ethanol (violet)

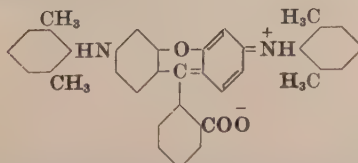
Slightly soluble in acetone

Very soluble in Cellosolve

 H_2SO_4 conc. — reddish orange; on dilution — red violet HNO_3 conc. — magenta

HCl conc. — red violet

Aqueous solution + HCl — bluish ppt.

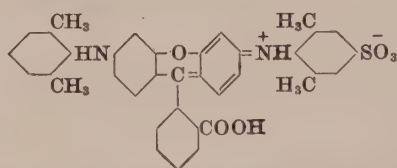
45195 Solvent Dye

Condense 3',6'-dichlorofluoran with 2,6-xyldine

Discoverer — M.L.B. 1888

Violamine 3G Spirit Soluble (IG)M.L.B., *GP* 48367, 49057, 53300, (Fr. 2, 79, 79, 81)Bayer Co., *GP* 416618 (Fr. 15, 448), see also Fr. 15, 425*BIOS* 959, 17

45196 Acid Dye



Sulfonate Violamine 3G Spirit Soluble (IG) (C.I. 45195)

Discoverer — M.L.B. 1889

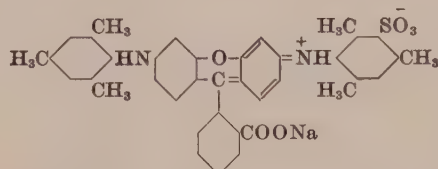
Fast Acid Pink B (MLB)

Dyes wool and silk in presence of sulfuric acid

Fastness Properties (C): Alkali 3-4, Light 5, Milling 2-3, Perspiration 2-3, Sea Water 2-3, Washing 3-4, 3, 3

References as for C.I.45195

45200 Acid Dye



Condense mesidine (2,4,6-trimethylaniline) with 3',6'-dichlorofluoran, sulfonate the product and convert to the sodium salt

Discoverer — M.L.B. 1891

Violamine G (MLB). Acid Rosamine A (MLB)

Dyes wool and silk in presence of sulfuric acid

Fastness Properties (C): Alkali 4, Light 2, Milling 2-3, Perspiration 3, Sea Water 3, Washing 2-3, 3

M.L.B., *FP* addn. to 201660; *GP* 67844 (*Fr.* 3, 174)

Bayer Co., *BP* 223596; *USP* 1543166

Soluble in water (yellowish pink)

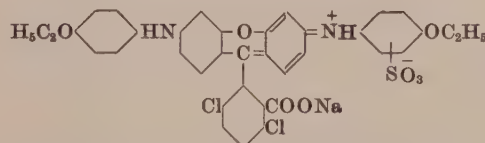
Slightly soluble in ethanol

H₂SO₄ conc. — brownish yellow; on dilution — redder solution with red ppt.

Aqueous solution + HCl — red flocculent ppt.

Aqueous solution + NaOH — yellow ppt.

45205 C.I. Acid Blue 19 (Reddish blue)



React *p*-phenetidine with 3',4,6',7-tetrachlorofluoran, sulfonate the product and convert to the sodium salt

Discoverer — Boedeker 1889

M.L.B., *BP* 9600/88; *FP* 192589, addn. to 201660; *GP* 48367, 49057, 53300, (*Fr.* 2, 79, 79, 81), 85805 (*Fr.* 4, 237)

JSDC, 9 (1893), 77

BIOS 959, 17

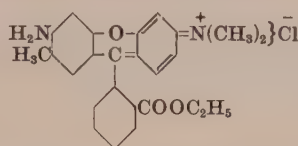
Soluble in water (dark blue)

Slightly soluble in ethanol (dark blue)

H₂SO₄ conc. — dark bordeaux red; on dilution — blue ppt.

Aqueous solution + NaOH — violet, which reddens on heating

45210 C.I. Basic Red 3 (Bright bluish pink)



Condense *m*-dimethylaminophenol (1 mol.) with phthalic anhydride (1 mol.), then condense the product with 3-amino-*p*-cresol, and finally ethylate

Discoverer — Müller 1895

Chem. Fabr. Bindschedler, Basle, *BP* 4985/95, 12180/97; *USP* 584119, 695441; *FP* 245593, 317891; *GP* 85931, 87068, ap. B16962, B17374, (*Fr.* 4, 260, 262, 262, 263), 96108 (*Fr.* 5, 229), 132066 (*Fr.* 6, 282)

Schultz, *Farbstofftabellen*, 7th Ed., 868

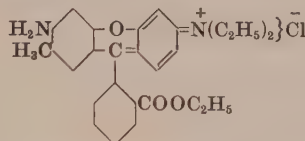
Soluble in water (crimson red with a brown fluorescence)

Soluble in ethanol (scarlet red with a green fluorescence)

H₂SO₄ conc. — yellow; on dilution — red

Aqueous solution + NaOH — scarlet red ppt.

45215 C.I. Basic Red 4 (Bright bluish pink)



Prepare as for C.I.45210 with *m*-diethyl-, instead of *m*-dimethylaminophenol

Discoverer — Müller 1895

Patents as for C.I.45210

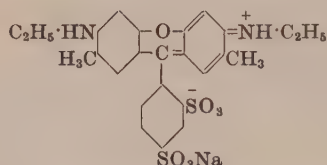
BIOS 959, 12

FIAT 764 — Rhodamin 3GO (also known as Irisamin O)

Brown & Mason, *JCS* (1933), 1264

Solubilities and reactions similar to those of C.I.45210

45220 C.I. Acid Red 50 (Bright yellowish pink)



Condense 4-formyl-*m*-benzenedisulfonic acid with 3-ethylamino-*p*-cresol, dehydrate the product with sulfuric acid, oxidise and convert to the sodium salt

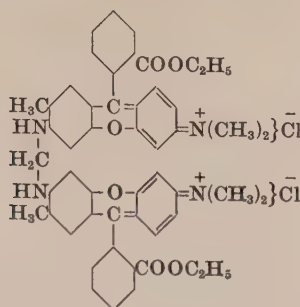
Discoverer — Emmerich 1906

M.L.B., *USP* 1006738; *GP* 205758 (*Fr.* 9, 216, 229, 466; 10, 244)

FIAT 764 — Sulfurhodamin G

Solubilities and reactions similar to those of C.I.45100

45225 Basic Dye



Discoverer — Brack 1899

Rhodine BS (SCI), Cotton Rhodine BS (SCI)

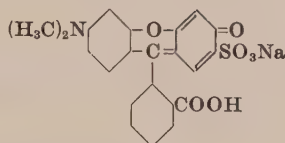
Dyes tannin-mordanted cotton bright violet red
Cassella Co., *USP* 643371; *GP* 109883 (*Fr.* 5, 232)

Soluble in water (bluish red)
 H_2SO_4 conc. — yellowish brown; on dilution — reddish brown ppt.
Aqueous solution + NaOH — reddish brown ppt.

React formaldehyde with **Rhodamine 3G (C.I.45210)**

(II) — AMINO-HYDROXY-DERIVATIVES (RHODOLS)

45300 C.I. Mordant Red 77 (Bluish pink)



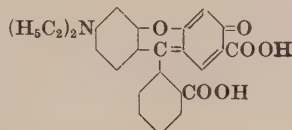
Condense *m*-dimethylaminophenol with phthalic anhydride and condense the product with 2,4-dihydroxybenzenesulfonic acid

Discoverers — de la Harpe and Bodmer 1911

Durand & Huguenin, *BP* 10523/11; *USP* 1002825, 1003257; *FP* 429302; *GP* 244652, 244653 (*Fr.* 10, 236, 239)

Soluble in water (cherry red with a strong yellow fluorescence)
 H_2SO_4 conc. — lemon yellow with a green fluorescence; on dilution — orange red and then to pink
Aqueous solution + HCl — fluorescence disappears

45305 C.I. Mordant Red 15 (Bluish red)



Condense *m*-diethylaminophenol (1 mol.) with phthalic anhydride (1 mol.), then condense the product with β -resorcylic acid and oxidise

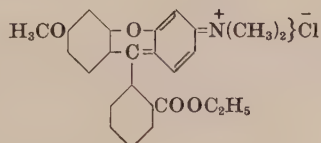
Discoverer — I.G.

BIOS 959, 4

FIAT 764 — Chromogenrot B

Brown & Mason, *JCS* (1933), 1264

45310 Basic Dye



Condense *m*-dimethylaminophenol (1 mol.) with phthalic anhydride (1 mol.), then condense the product with *m*-methoxyphenol and ethylate

Discoverer — Brack 1900

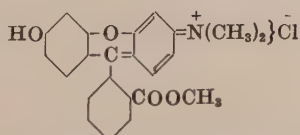
Rhodamine 12GM (SCI), Rhodine 12GM (SCI)

Dyes tannin-mordanted cotton yellowish red
Cassella Co., *GP* 108419 (*Fr.* 6, 230), 122289 (*Fr.* 6, 279)
cf. M.L.B., *BP* 15983/99; *USP* 656426; *FP* 291621 *GP* 116057, 119061 (*Fr.* 6, 271, 274)

Soluble in water and ethanol (yellowish red)
 H_2SO_4 conc. — yellow; on dilution — yellowish red
Aqueous solution + NaOH — light red ppt.

45315 Basic Dye

Formaldehyde treated



Condense *m*-dimethylaminophenol with phthalic anhydride, condense the product with resorcinol, methylate, and treat with formaldehyde

Discoverer — Brack 1898

Rhodamine 12GF, 12G extra (SCI)

Dyes tannin-mordanted cotton a yellower red than C.I.45310
Chem. Fabr. Bindschedler, Basle, *BP* 18477/98; *USP* 613113, 625536; *FP* 280925; *GP* 106720 (*Fr.* 5, 231)

Soluble in water and ethanol (yellowish red)
 H_2SO_4 conc. — yellow; on dilution — yellowish red
Aqueous solution + NaOH — light red ppt.

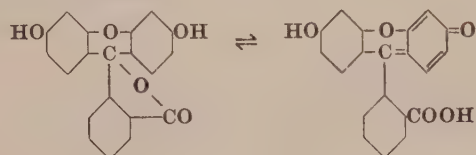
(III) — HYDROXY-DERIVATIVES (FLUORONE COLOURING MATTERS)

(a) HYDROXY-PHTHALEÏNS

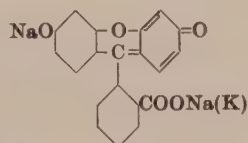
45350 C.I. Acid Yellow 73

45350:1 (C.I. Solvent Yellow 94) is the free acid

Classical name **Fluoresceïn**



Classical name **Uranine**



Condense resorcinol with phthalic anhydride, alone or in presence of zinc chloride or sulfuric acid, for **Fluoresceïn**, and convert to sodium or potassium salt for **Uranine**

H₂SO₄ conc. — yellow with faint fluorescence; on dilution — yellow with yellow ppt.

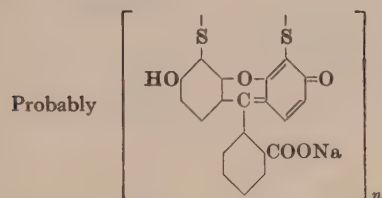
Aqueous solution + NaOH — darker solution with a dark green fluorescence

Discoverer — Baeyer 1871

BIOS 959, 8, 15. FIAT 764 — Fluoresceïn
Baeyer, *Ber.* 4 (1871), 558, 662; 8 (1875), 146; *Ann.* 183 (1876), 2; 212 (1882), 347; 372 (1910), 107
E. Fischer, *Ber.* 7 (1874), 1211
Schreder, *Ber.* 11 (1878), 1342
Mühlhäuser, *Dingl.* 263 (1887), 49; 283 (1892), 182
Le Royer, *Ann.* 238 (1887), 360
R. Meyer & Oppelt, *Ber.* 21 (1888), 3376
R. Meyer, *Ber.* 24 (1891), 1412; 28 (1895), 428; *Z. phys. Chem.* 24 (1897), 468
R. Meyer & Hoffmeyer, *Ber.* 25 (1892), 1385, 2118
R. Meyer & Saul, *Ber.* 25 (1892), 3586
Bernthsen, *Chem. Zig.* 16 (1892), 1956
O. Fischer & Hepp, *Ber.* 26 (1893), 2236; 27 (1894), 2790; 28 (1895), 396
Graebe, *Ber.* 28 (1895), 28
Nietzki & Schröter, *Ber.* 28 (1895), 44
Heller, *Ber.* 28 (1895), 312
Gattermann, *Ber.* 32 (1899), 1135
Hewitt, *Proc. CS.* 16 (1900), 3; *Z. phys. Chem.* 34 (1900), 5
Hewitt & Tervet, *JCS.* 81 (1902), 665
Kropp & Decker, *Ber.* 42 (1909), 578
Kehrmann & Dengler, *Ber.* 42 (1909), 870
Lombard, *Bull. Soc. chim.* 29 (4) (1921), 462
O. Fischer & Bollmann, *J. prakt. Chem.* 104 (1922), 123
Sansone, *Rev. gén. Mat. col.* 28, 127
Batscha, *Ber.* 59 (1926), 311
Orndorff & Hemmer, *JACS.* 49 (1927), 1272

Soluble in water and ethanol (yellow with intense green fluorescence)

45355 Acid Dye



React **Fluoresceïn** (C.I.45350) with sodium sulfide

Note — The dithiol is the powerful mordant dye **Thiogalleïn**

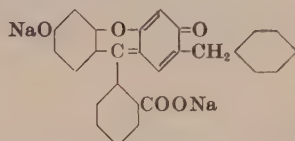
Discoverer — Wyler 1894

Thiofluoresceïn (not the sulfur analogue of C.I.45350 but *fluoresceïn disulfide*)

Gattermann, *Ber.* 32 (1899), 1127
Meyer & Szanecki, *Ber.* 33 (1900), 2577
Maki, *J. Coll. Eng. Tokyo.* 11 (1920), 1; cf. *JSDC.* 37 (1921), 119;
Rev. gén. Mat. col. 25 (1921), 81

Almost insoluble in ethanol, ether, and benzene
More soluble in carbon disulfide

45360 C.I. Acid Yellow 74



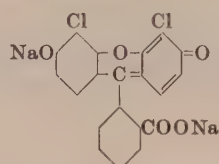
Condense resorcinol, phthalic anhydride, and α -chlorotoluene (benzyl chloride) in concentrated sulfuric acid

Discoverer — Reverdin 1877

Reverdin, *FP* 113695
Reverdin, *Monit. sci.* 7 [3] (1877), 860, 1104; *Z. Chem. Grossgew.* 2 (1877), 456, 668; 3 (1878), 625
Wilm, Bouchardat, & Girard, *Monit. sci.* 7 [3] (1877), 985

Soluble in water (brown with a green fluorescence)
H₂SO₄ conc. — yellow; on dilution — brown yellow ppt.

45365 C.I. Solvent Orange 32



Condense 2-chlororesorcinol (1 mol.) with phthalic anhydride (1 mol.), then condense the product with 2-chlororesorcinol and convert to the sodium salt

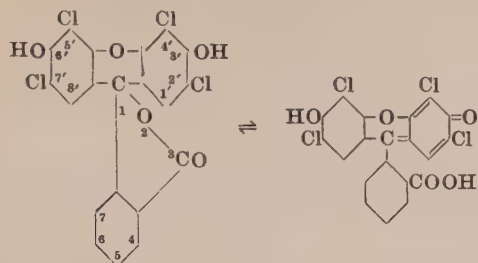
Discoverers — Milligan and Hope 1945

Milligan & Hope, *JACS.* 67 (1945), 1507

Solubilities and reactions similar to those of C.I.45370

45366 C.I. Solvent Red 42 (Bluish pink)

Pectynin & Kuchina, *J. Gen. Chem.* (U.S.S.R.), **17** (1947), 278
(see *Chem. Abs.* **42** (1948), 534)



Condense 2,4-dichlororesorcinol (2 mol.) with phthalic anhydride (1 mol.), isolate the 2',4',5',7'-tetrachlorofluorescein (m.p. 296–305°C) by extraction with sodium hydroxide, and acidify with hydrochloric acid

Insoluble in water
Soluble in aqueous 10% NaOH

45370 C.I. Acid Orange 11 (Reddish orange)

45370:1 (C.I. Solvent Red 72) is the free acid

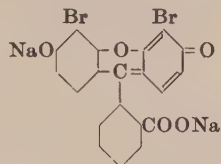
45370:2 (C.I. Pigment Orange 39) is the aluminium salt

Discoverer — Badische Co.

BIOS 959, 6, 26

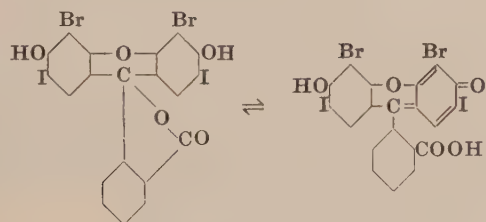
FIAT 764 — Eosin H 8G

Am. J. Pharm. (Sept. 1942), 342 (see also *Coal-tar Color Regulations*, U.S. Food and Drug Administration, Sept. 1940, 13)



Dibrominate **Fluorescein** in aqueous sodium hydroxide and isolate as the sodium salt

Slightly soluble in water (orange with faint yellow fluorescence)
Soluble in ethanol (orange with a greenish yellow fluorescence)
Soluble in acetone (pink with a yellow fluorescence)
Very soluble in furfuryl and tetrahydrofurfuryl alcohol
H₂SO₄ conc. — red yellow; on dilution — yellow brown with orange ppt.
Aqueous solution + NaOH — eosine red
Glycerol and liquid paraffin — good dispersion

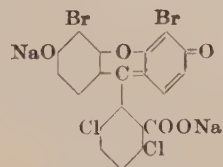
45371 C.I. Solvent Orange 18

Coal-tar Color Regulations, U.S. Food and Drug Administration, Sept. 1940, 16

Am. J. Pharm. (Sept. 1942), 341

Insoluble in water
Slightly soluble in ethanol
Soluble in aqueous 5% Na₂CO₃
H₂SO₄ conc. — yellow; on dilution — orange ppt.
10% aqueous NaOH — bright pink

Prepare in an analogous manner to **C.I.45366**

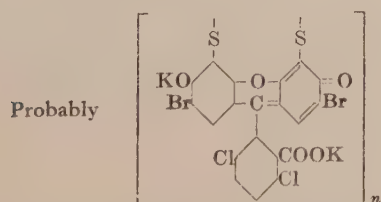
45375 Acid Dye

Dibrominate 4,7-dichlorofluorescein with bromine, sodium chlorate, and ethanol as solvent

Discoverer — I.G.

Phloxine N

BIOS 959, 10

45376 Acid Dye

React 4,7-dichlorofluorescein with sodium sulfide, dibrominate the product, and convert to the potassium salt

Note — The methyl ester is **Thiocyanosine (Mo)** — (GP 52139)

Discoverers — Société Gilliard, Monnet and Cartier 1889

Cyclamine (Mo), Thiophloxine (Mo)

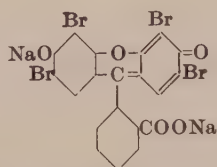
Dyes wool from a neutral bath

Soc. Gilliard, Monnet & Cartier, *FP* 196363; *GP* 52139 (*Fr.* **2**, **9**)

Soluble in water (magenta red without fluorescence)
H₂SO₄ conc. — orange; on dilution — red flocculent ppt.
Aqueous solution + HCl — scarlet ppt.

- 45380** C.I. Acid Red 87 (Yellowish pink)
45380:1 (C.I. Pigment Red 90) is the lead salt
45380:2 (C.I. Solvent Red 43) is the free acid
45380:3 (C.I. Pigment Red 90:1) is the aluminium salt

Classical name Eosine

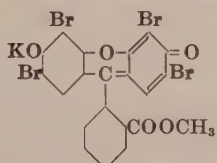


Brominate **Fluorescein** (C.I.45350) in aqueous or ethanolic solution to the tetrabromo derivative, and convert to the sodium salt

Discoverer — Caro 1871
 Usines du Rhône, *GP* 108838 (*Fr.* 5, 215)
 A. W. Hofmann, *Ber.* 8 (1875), 62
 Baeyer, *Ber.* 8 (1875), 147; *Ann.* 183 (1876), 38
 Bindschedler & Busch, *Mon. sci.* 20 (1878), 1170
 Mühlhäuser, *Dingl.* 263 (1887), 49; 284 (1892), 21, 46
 Bernthsen, *Chem. Ztg.* 16 (1892), 1956
 Heller, *Ber.* 28 (1895), 312
 R. Meyer, *Ber.* 28 (1895), 1576
 R. Meyer & H. Meyer, *Ber.* 29 (1896), 2623
 Knecht, *JSDC*, 21 (1905), 294
 Scott & French, *The Military Surgeon*, November 1924
 Delaplace, *Compt. rend.* 183 (1926), 69
 Girard & Peyre, *Compt. rend.* 183 (1926), 84
 BIOS 959, 6
 FIAT 764 — Eosin G

Soluble in water and ethanol (bluish red with a yellowish green fluorescence)
 H_2SO_4 conc. — yellow; on dilution — yellowish red ppt.

- 45385** C.I. Solvent Red 44 (Bright bluish red)

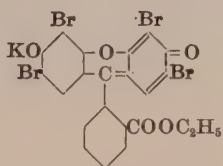


Methylate **Eosine** (C.I.45380) and convert to the potassium salt

Discoverer — Caro 1874
 Baeyer, *Ann.* 183 (1876), 53
 Bindschedler & Busch, *Mon. sci.* 20 (1878), 1172
 Herzig, *Mhft. Chem.* 13 (1892), 422
 Bernthsen, *Chem. Ztg.* 16 (1892), 1956
 Nietzki & Schröter, *Ber.* 28 (1895), 44

Soluble in hot water (cherry red)
 Soluble in aqueous ethanol (red with a brownish yellow fluorescence)
 H_2SO_4 conc. — yellow; on dilution — brownish yellow ppt.
 Aqueous solution + NaOH — darker solution with a green fluorescence

- 45386** C.I. Solvent Red 45 (Bright bluish red)

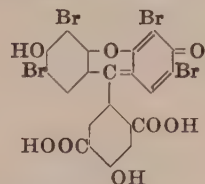


Ethylate **Eosine** (C.I.45380) and convert to the potassium salt

Discoverer — Caro 1874
 Baeyer, *Ann.* 183 (1876), 46
 Bindschedler & Busch, *Chem. News*, 38 (1878), 226
 Mühlhäuser, *Dingl.* 263 (1887), 49, 100; 283 (1892), 210
 Bernthsen, *Chem. Ztg.* 16 (1892), 1957
 Nietzki & Schröter, *Ber.* 28 (1895), 46
 BIOS 959, 7

Slightly soluble in hot water (cherry red with a faint greenish-yellow fluorescence)
 Slightly soluble in ethanol (red and a brownish yellow fluorescence)
 H_2SO_4 conc. — yellow; on dilution — brownish yellow ppt.

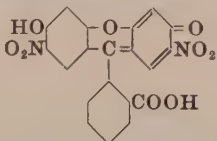
- 45390** Mordant Dye



Condense 5-hydroxytrimellitic acid with resorcinol and tetrabrominate

Discoverer — I.G.
Chromoxane Brilliant Red RD (IG)
 FIAT 1313, 2, 354

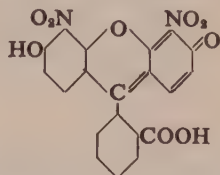
- 45395** Solvent Dye (Yellowish orange)



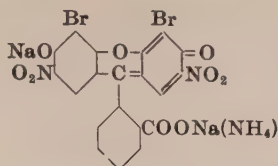
Nitrate **Fluorescein** with concentrated sulfuric acid (66°Bé) and 98% nitric acid at 0°C

Discoverer — I.G.
Orange for Lipsticks (IG)
 BIOS 959, 10
 FIAT 764 — Orange fuer Lippenstifte

- 45396** C.I. Solvent Orange 16 (Yellowish orange)



Hewitt & Woodford, *JCS* 77 (1900) 1326, 81 (1902) 893
Proc. Chem. Soc. 18 (1902) 128

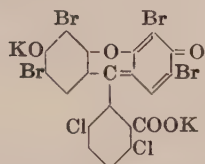
45400 C.I. Acid Red 91 (Bright bluish red)

Nitrate 4',5'-**Dibromofluorescein (C.I.45370)** and convert to the sodium or ammonium salt

Discoverers — Caro 1875; Baeyer 1876
Baeyer, *Ann.* **183** (1876), 61; **202** (1880), 68
Witt, *Chem. Ind.* **9** (1886), 4
Mühlhäuser, *Dingl.* **263** (1887), 49, 103; **284** (1892), 93
Matras, *Chem. Ztg.* **19** (1895), 408
Hewitt & Woodforde, *JCS*, **81** (1902), 893
BIOS 959, 6
FIAT 764 — Eosin BMX

45405 C.I. Acid Red 98 (Bluish red)

Classical name **Phloxine**



Tetrabrominate the 4,7-dichlorofluorescein obtained by condensation of resorcinol with 3,6-dichlorophthalic anhydride, and convert to the potassium salt

Discoverer — Noeltig 1875
Casthelaz, *BP* 447/79
Chem. Ind. **3** (1880), 59
Le Royer, *Ann.* **238** (1887), 358
Graebe, *Ber.* **33** (1900), 2019
Graebe & Gourevitz, *Ber.* **33** (1900), 2023
BIOS 959, 10

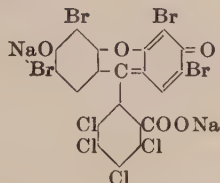
Soluble in water (cherry red with a greenish yellow fluorescence)
 H_2SO_4 conc. — brownish yellow unaltered by heating; on dilution — brownish yellow ppt.
Aqueous solution + NaOH — bluish red solution

45410 C.I. Acid Red 92 (Bright pink)

45410:1 (C.I. Solvent Red 48) is the free acid

45410:2 (C.I. Pigment Red 174) is the aluminium salt

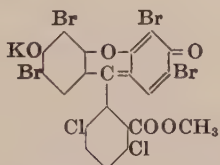
Classical name **Phloxine B**



Tetrabrominate the 4,5,6,7-tetrachlorofluorescein obtained by condensation of resorcinol with tetrachlorophthalic anhydride, and convert to the sodium salt

Discoverer — Gnehm 1882
Ciba, *USP* 322368; *GP* 32564 (*Fr.* **1**, 318), 50177 (*Fr.* **2**, 93)
Graebe, *Ann.* **238** (1887), 333

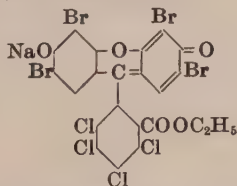
Soluble in water (bluish red and a faint dark green fluorescence)
Soluble in ethanol (bluish red with a brick red fluorescence)
 H_2SO_4 conc. — yellow; on dilution — yellowish red ppt.

45415 Solvent Dye

Methylate **Phloxine (C.I.45405)**

Discoverer — Noeltig 1876
Cyanosine (Spirit Soluble) (MLB)
FDX 885 — Cyanosin

Insoluble in water
Soluble in ethanol (bluish red with a reddish yellow fluorescence)
 H_2SO_4 conc. — yellow; on dilution — reddish brown ppt.
Aqueous solution + HCl — fluorescence disappears

45420 Acid Dye (Yellowish red)

Ethylate **Phloxine B (C.I.45410)**

Discoverer — Gnehm 1882

Cyanosine B

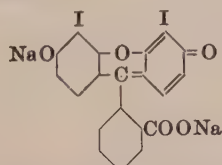
Dyes wool bluish red from a weak acid dyebath and is used for spirit varnishes

Slightly soluble in water (red with a yellow fluorescence)
 H_2SO_4 conc. — yellowish brown; on dilution — brownish red ppt.

45425 C.I. Acid Red 95 (Yellowish red)

45425:1 (C.I. Solvent Red 73) is the free acid

45425:2 (C.I. Pigment Red 191) is the aluminium salt



Diiodinate **Fluorescein (C.I.45350)** in aqueous solution with iodine and iodic acid or with iodine chloride and alkali

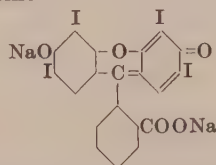
Note — **Erythrosine 6G** is a mixture of the sodium salts of monoiodo- and a little diiodofluorescein (*BIOS* 959, 7)

Discoverer — Noeltig 1875
BIOS 959, 7
FIAT 764 — Erythrosin 6G

Soluble in water (cherry red without fluorescence)
 H_2SO_4 conc. — brownish yellow; on dilution — brownish yellow ppt.
Aqueous solution + NaOH — soluble red ppt.

45430 C.I. Acid Red 51 (*Bluish pink*)
 C.I. Food Red 14
45430:1 (C.I. Pigment Red 172) is the aluminium salt
45430:2 (C.I. Solvent Red 140) is the free acid

Classical name **Erythrosine**

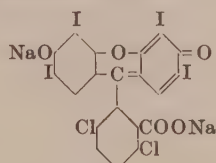


Tetraiodinate **Fluorescein** (C.I. 45350) in aqueous or ethanolic solution and convert to the sodium salt

Discoverer — Kussmaul 1876
 Usines du Rhône, *GP* 108838 (*Fr.* 5, 215)
 Bindschedler & Busch, *Mon. sci.* 20 (1878), 1171
 Mühlhäuser, *Dingl.* 263 (1887), 106; 283 (1892), 234, 258
 Leys, *Ann. Chim. anal.* 21 (1916), 25
 Gornberg & Tabern, *Ind. Eng. Chem.* 14 (1922), 1113
 Kober, *Ind. Eng. Chem.* 15 (1923), 837
 Wales & Nelson, *JACS*, 45 (1923), 1663
 BIOS 959, 7. BIOS 1433, 75
 FIAT 764 — Erythrosin J

Soluble in water (cherry red without fluorescence)
 H_2SO_4 conc. — brownish yellow; on dilution — brownish yellow ppt.
 Aqueous solution + NaOH — soluble red ppt.

45435 C.I. Acid Red 93 (*Bluish red*)
45435:1 (C.I. Solvent Red 47) is the free acid

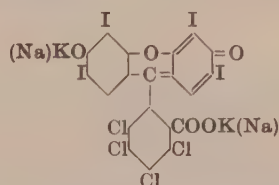


Tetraiodinate 4,7-dichlorofluorescein with iodine in presence of potassium or sodium chlorate and cupric chloride

Discoverer — Noelting 1875
 Le Royer, *Ann.* 238 (1887), 359
 Leys, *Ann. Chim. anal.* 21 (1916), 25; cf. *JSDC*, 32 (1916), 121
Coal-tar Color Regulations, U.S. Food and Drug Administration, Sept. 1940, 22
 BIOS 959, 3
 FIAT 764 — Bengalrosa GTO

Soluble in water (cherry red with no fluorescence)
 H_2SO_4 conc. — brownish yellow; on dilution — brownish red ppt.
 Aqueous solution + NaOH — crimson red soluble ppt.

45440 C.I. Acid Red 94 (*Bright bluish pink*)
45440:1 (C.I. Solvent Red 141) is the free acid

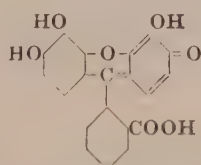


Tetraiodinate 4,5,6,7-tetrachlorofluorescein obtained by condensation of resorcinol with tetrachlorophthalic anhydride, and convert to the potassium salt

Discoverer — Gnehm 1882
 Ciba, *USP* 322368; *GP* 32564 (*Fr.* 1, 318), 50177 (*Fr.* 2, 93)
 BIOS 959, 13

Soluble in water (bluish red without fluorescence)
 H_2SO_4 conc. — brown; on dilution — flesh pink ppt.

45445 C.I. Mordant Violet 25 (*Bluish violet*)



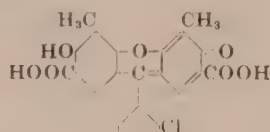
Heat gallic acid (or pyrogallol) with phthalic anhydride at 190–200°C or **Gallein**, and convert to the sodium salt for **Alizarine Violet**

H_2SO_4 conc. — reddish yellow; on dilution — flocculent reddish yellow ppt.
 Aqueous solution + NaOH — blue

Discoverers — Baeyer (from pyrogallol) 1871
 Gürke (from gallic acid) 1884
 Gürke, *GP* 30648, 32830, (*Fr.* 1, 319, 320)
 FIAT 764 — Gallein
 Baeyer, *Ber.* 4 (1871), 457, 555, 663
 Durand, *Bull. Soc. ind. Mulhouse*, 48 (1878), 326; *Monit. sci.* 8 [3] (1878), 1122
 Montlaur, *Monit. sci.* 10 [3] (1880), 1338
 Buchka, *Ann.* 209 (1881), 249; *Ber.* 14 (1881), 1326
 Herzig, *Mhfr. Chem.* 13 (1892), 425
 Orndorff & Brewer, *Am. Chem. J.* 23 (1900), 425; 26 (1901), 97
 Knecht, *JCS*, 125 (1924), 1537

Free acid
 Soluble in hot water (scarlet red)
 Soluble in hot ethanol (reddish brown)

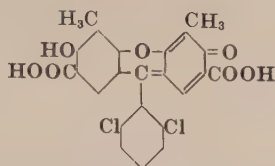
45450 Mordant Dye



Condense 3-methyl- β -resorcylic acid with *o*-chlorobenzaldehyde in concentrated sulfuric acid, and oxidise with nitrosyl sulfuric acid

Discoverer — Weiler 1923
Chromoxane Red B (By)
 Bayer Co., *BP* 247003; *USP* 1532790; *FP* 593774; *GP* 423093, 430832, (*Fr.* 15, 449, 450)

45455 Mordant Dye



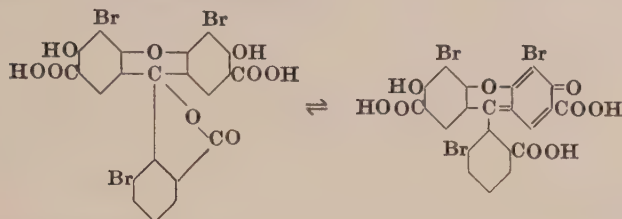
Condense 3-methyl- β -resorcylic acid with 2,6-dichlorobenzaldehyde in concentrated sulfuric acid, and oxidise with nitrosyl sulfuric acid

Discoverer — Weiler 1923

Chromoxane Red Violet 1358 (By)

Bayer Co., BP 247003; USP 1532790; FP 593774; GP 423093, 430832, (Fr. 15, 449, 450)

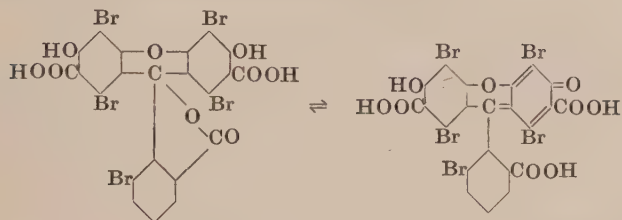
45456 C.I. Solvent Orange 17



Coal-tar Color Regulations, U.S. Food and Drug Administration, Sept. 1940, 15
Am. J. Pharm., (Sept. 1942), 343

Insoluble in water
Soluble in aqueous 5% Na_2CO_3

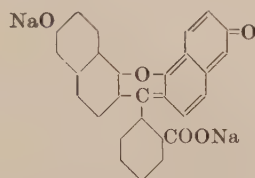
45457 C.I. Solvent Red 46 (Bluish pink)



Coal-tar Color Regulations, U.S. Food and Drug Administration, Sept. 1940, 22
Am. J. Pharm. (Sept. 1942), 345

Insoluble in water
Slightly soluble in aqueous 5% Na_2CO_3

45460 Acid Dye



Condense 1,6-naphthalenediol (2 mol.) with phthalic anhydride (1 mol.) and convert to the sodium salt

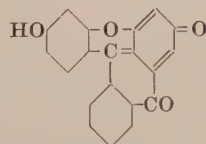
Discoverer — I.G.

BIOS 959, 14. BIOS 1433, 65

FIAT 764 — Scheckfarbstoff AS

(b) ANTHRAHYDROXY-PHTHALEÏNS

45500 Mordant Dye



Heat **Fluorescein (C.I.45350)** with a large proportion of concentrated sulfuric acid

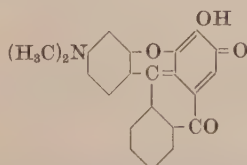
Discoverer — Baeyer 1876

Coerulein B (MLB)

An afterchrome green of poor fastness properties
cf. M.L.B., BP 7170/95; FP 246472; GP 86225 (Fr. 4, 225), 97640, 98075, (Fr. 5, 217, 217)
Baeyer, Ann. 183 (1876), 28

Soluble in water (red)
Aqueous solution + NaOH — greenish blue

45505 Mordant Dye



Condense *m*-dimethylaminophenol with phthalic anhydride, then condense the product with pyrogallol, and dehydrate by heating with 96% sulfuric acid at 155–160°C

Discoverer — Sandoz 1911

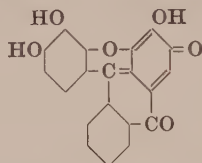
Ultraviridine B (S)

Dyes chromed cotton and wool dark green, fast to light
Sandoz, GP 257084 (Fr. 11, 717)
Cassella Co., BP 14220/00; FP 302725; GP 122352 (Fr. 6, 280)
cf. Bayer Co., BP 22818/07; FP 302725, 382920, 443377; GP 196752 (Fr. 9, 839)

Soluble in water and ethanol (blue)
 H_2SO_4 conc. — dark brown; on dilution — olive and then blue
Aqueous solution + NaOH — dark green ppt.

45510 C.I. Mordant Green 22 (Dull green)

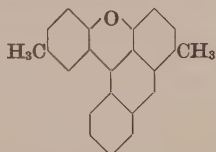
Bisulfite compound of



Heat **Gallein (C.I.45445)** with concentrated sulfuric acid to about 200°C, and convert the insoluble coerulein into the water-soluble bisulfite compound

Discoverers — Baeyer 1871; Prud'homme (bisulfite compound) 1879
 Badische Co., *BP* 3850/81 (provisional only)
 M.L.B., *GP* 252576 (*Fr.* 11, 719)
 I.G., *BP* 251968: *USP* 1656483; *FP* 614202; *Sw.P* 119722; *GP* 445847 (*Fr.* 15, 451)
FIAT 764 — Coerulein S
 Baeyer, *Ber.* 4 (1871), 556, 663
 Koechlin, *Bull. Soc. ind. Mulhouse*, 46 (1876), 550
 Prud'homme, *Bull. Soc. ind. Mulhouse*, 46 (1876), 1879
 Durand, *Bull. Soc. ind. Mulhouse*, 48 (1878), 326; *Mon. sci.* 8 (1878), 1122
 Buchka, *Ann.* 209 (1881), 272
JSDC, 1 (1885), 297
 Knecht, *JSDC*, 2 (1886), 112
 Orndorff & Brewer, *Am. Chem. J.* 23 (1900), 425; 26 (1901), 97

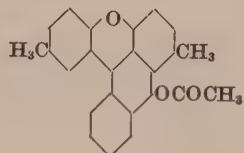
Slightly soluble in water (dull greenish brown)
 Soluble in hot ethanol (greyish blue)
 H_2SO_4 conc. — dark brown; on dilution — greenish black

(IV) — MISCELLANEOUS - DERIVATIVES**45550 C.I. Solvent Green 4 (Dull olive)*
C.I. Fluorescent Brightener 74**

Condense *p*-cresol (2 mol.) with phthalic anhydride (1 mol.) to 2',7'-dimethylfluoran, cyclise this in oleum (24%), reduce the product with zinc dust and ammonia under pressure to the dye, and purify by sublimation at 250–280°C/1–2 mm.

* Mineral oil

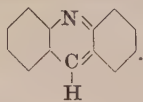
Discoverer — Badische Co.
BIOS 987, 185, 186
BIOS 1433, 107
FIAT 1313, 2, 61
FDX 885 — Fluorol 5G

45555 C.I. Fluorescent Brightener 155

Condense *p*-cresol (2-mol.) with phthalic anhydride (1 mol.) to 2',7'-dimethylfluoran, cyclise this in oleum (24%), reduce with zinc dust and caustic soda in presence of pyridine and acetylate with acetic anhydride to give 2,8-dimethyl-9-ceroxenol acetate.

Discoverer T. A. Cassidy 1938
 Wilmot and Cassidy Inc., *USP* 2127107
 Ferrario, *Ann.* 348 (1906) 226
 Venkataraman, *The Chemistry of Synthetic Dyes*, 1952, 747

ACRIDINE COLOURING MATTERS

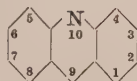
Acridine, the parent of this class of dyes, is a colourless basic compound. In its quinonoid form it contains the *o*-fuchson-imine chromophore . Dyes are obtained by introducing auxochromes¹ into the aryl groups in the *para*-position to the C-atom of the methane residue.

The dyes are not prepared directly from acridine, but by condensing *m*-diamines with aldehydes such as formaldehyde or benzaldehyde, cyclising, and subsequently oxidising.

The acridine bases form salts with mineral acids giving yellow, orange, red, and brown dyes, which have proved to be very suitable for leather owing to their fastness to light on this substrate. To a lesser degree, the dyes are used in textile printing, and as basic dyes for silk and the various forms of cellulose. None of the known acridine dyes meets the standards of fastness demanded for wool. Some acridine derivatives, which are not now in use as dyes, possess important antiseptic and medicinal properties. An interesting use of the dye Acridine Yellow (C.I.46025) is as an industrial antiseptic for arresting the growth of organisms which attack iron pipes.

Orange acridine dyes are purer in hue than Chrysoidine (C.I.11270 and C.I.11320), and are faster to stoving, washing, alkalis, and organic and mineral acids than the latter.

The system of numbering adopted is —

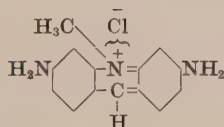


References

- Hewitt, *Dyestuffs derived from Pyridine, Quinoline, Acridine and Xanthene*, Longmans, Green & Co., London, 1922
A. Albert, *The Acridines*, Edward Arnold & Co., London, 1951
Lubs, *The Chemistry of Synthetic Dyes and Pigments*, Reinhold Publishing Corporation, New York, 1955

¹ Usually amino or alkylamino substituents

46000 Basic Dye



Heat *m*-phenylenediamine with oxalic acid, glycerol, and a condensing agent, and methylate with dimethyl sulfate or methyl *p*-toluenesulfonate

Very soluble in water (yellow and a green fluorescence at great dilution)
Soluble in ethanol (orange with a strong yellowish green fluorescence)
 H_2SO_4 conc. — pale yellow with an intense bluish green fluorescence
Aqueous solution + NaOH — orange ppt. which dissolves on heating

Discoverers — Ehrlich and Benda 1910

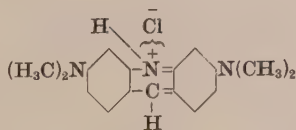
Acriflavine (By)

Dyes tannin-mordanted cotton a pure yellow of good fastness to washing. It is not now in commercial use as a dye but is widely used as an antiseptic
Cassella Co., BP 24652/10; USP 1005176; FP 433079 and addns.; GP 230412, 243085, (Fr. 10, 286, 1314)
Poulenc Frères, BP 137214
Schöpf, Ber. 27 (1894), 2320
Benda, Ber. 45 (1912), 1787
Ehrlich & Benda, Ber. 46 (1913), 1933
Grandmougin & Smirous, Ber. 46 (1913), 3425
Browning, Gulbransen, Kennaway & Thornton, Brit. Med. Jour. 98 (1917), 73; Proc. Roy. Soc. 90 (1918), 136
Thieme, Ber. Pharm. Ges. 31 (1921), 323
Albert, JCS (1941), 121, 484
Albert, Rubbo, & Goldacre, Nature, 147 (1941), 332
Albert & Ritchie, JSCI, 60 (1941), 120
Albert & Gledhill, JSCI, 61 (1942), 159; 64 (1945), 169
Albert & Bird, JSDC, 59 (1943), 74
Albert & Magrath, JSCI, 64 (1945), 30

46005 C.I. Basic Orange 14 (Bright yellowish orange)

46005:1 (C.I. Solvent Orange 15) is the free base

Zinc double chloride of

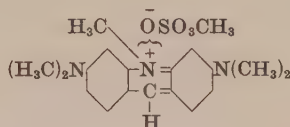


Dinitrate *p,p'*-methylenebis[*N,N*-dimethylaniline], reduce the 4,4'-methylenebis[*N,N*-dimethyl-3-nitroaniline], cyclise the diamino compound by heating with acids, oxidise the product, and convert to the zinc double chloride

Discoverer — Bender 1889

Leonhardt Co., BP 8243/90; USP 503305; FP 205459; GP 59179, 67126, (Fr. 3, 290, 292);
cf. Gerber Co., GP 60505 (Fr. 3, 96)
BIOS 959, 2, 8, 12, 42
FIAT 1004, 10. FIAT 1313, 2, 370
FIAT 764 — Rhodulinorange NO, Euchrysin 3RX
Von Perger, Mitt. Gew. Mus. (1891), 249; cf. JSCI, 11 (1892), 30
Biehringer, J. prakt. Chem. 54 (1896), 245
Hannay, JSDC, 31 (1915), 250

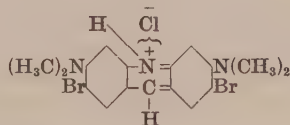
Soluble in water and ethanol (orange yellow with a green fluorescence)
 H_2SO_4 conc. — almost colourless with a green fluorescence; on dilution — orange yellow
Aqueous solution + NaOH — yellow ppt.



Methylate C.I.46005 with dimethyl sulfate

Soluble in water (reddish orange)
Slightly soluble in ethanol (reddish orange)
H₂SO₄ conc. — bluish red
Aqueous solution + HCl — bluish red

46015 Basic Dye



Dibrominate C.I.46005 or its leuco compound in sulfuric acid or nitrobenzene solution

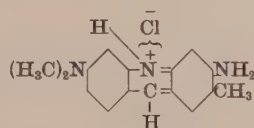
Discoverers — Vaucher and Speitel 1920

Acridine Scarlet J (DH)

Dyes tannin-mordanted cotton yellowish red
Durand & Huguenin, *BP* 165721; *USP* 1418852; *FP* 536409;
Sw.P 95843; *GP* 360664 (*Fr.* 14, 798)
Brit. Dye. Corp. *BP* 194165
JSDC, 40 (1924), 366

Soluble in water and ethanol (orange red)
H₂SO₄ conc. — yellow with a green fluorescence; on dilution — magenta red then orange red
Aqueous solution + NaOH — yellow ppt.

46020 C.I. Basic Yellow 7



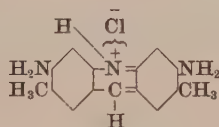
React formaldehyde with a mixture of toluene-2,4-diamine and *N,N*-dimethyl-*m*-phenylenediamine, heat the product with 20% sulfuric acid to eliminate ammonia, and oxidise with ferric chloride

Discoverer — Nastvogel 1900

Bayer Co., *BP* 11035/00; *USP* 675568; *FP* 301256; *GP* 133709
(*Fr.* 6, 478)
Geigy., *GP* 161699 (*Fr.* 8, 528)
Ullmann & Fitzekam, *Ber.* 38 (1905), 3787

Soluble in water and ethanol (orange yellow with a yellowish green fluorescence)
H₂SO₄ conc. — light yellowish brown; on dilution — orange red then orange yellow
Aqueous solution + NaOH — yellow ppt. and colourless solution

46025 Basic Dye



React formaldehyde with toluene-2,4-diamine, heat the product with aqueous hydrochloric acid, or fuse with ammonium chloride to eliminate ammonia, and oxidise with ferric chloride

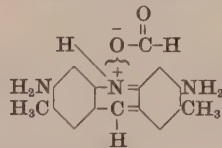
Discoverer — Bender 1889

Acridine Yellow G and T (L)

Formerly used in coloured discharges or to give a white discharge with chlorate
Leonhardt Co., *BP* 1797/89; *FP* 201798; *GP* 52324 (*Fr.* 2, 109)
Geigy, *FP* 330487; *GP* 149409 (*Fr.* 7, 314)
FIAT 1004, 10
Ullmann & Naef, *Ber.* 33 (1900), 915
Ullmann & Marić, *Ber.* 34 (1901), 4308

Soluble in water and ethanol (yellow with a green fluorescence)
H₂SO₄ conc. — light yellow; on dilution — yellow ppt.
Aqueous solution + NaOH — yellow ppt.
Aqueous solution + HNO₂ — intense purple

46030 C.I. Basic Yellow 6 (Yellow)



Treat the base of C.I.46025 with formic acid

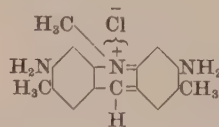
The ratios are important: 85% formic acid (21 parts) and colour base (140 parts); or 85% formic acid (14-16 parts) and base (60 parts)

Discoverer — Nastvogel 1902

Bayer Co., *BP* 11666/02; *USP* 716084; *FP* 321272; *GP* 140848
(*Fr.* 7, 324)
BIOS 959, 2
FIAT 1313, 2, 371
FIAT 764 — Aurazin G

Soluble in water and ethanol (yellow with a green fluorescence)
H₂SO₄ conc. — yellowish with a green fluorescence; on dilution — reddish brown then yellowish brown
Aqueous solution + NaOH — light yellow ppt.

46035 C.I. Basic Orange 4-11



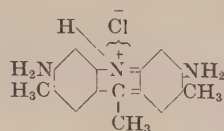
React C.I.46025 with dimethyl sulfate or methyl *p*-toluenesulfonate

Note — There are many similar alkylated dyes on the market (see C.I. Basic Orange 4-11). They are made, for example, by alkylating C.I.46025 or C.I.46065

The amino groups are alkylated when alcohols and a mineral acid or alkyl halides are used, but the use of dimethyl sulfate or of methyl (or ethyl) *p*-toluenesulfonate leads to the formation of true acridinium compounds

S.C.I., Basle, *FP* 241916; *GP* 79703 (*Fr.* 4, 1044)
Leonhardt Co., *GP* 131289 (*Fr.* 6, 485)
Cassella Co., *GP* 135771 (*Fr.* 6, 489)
M.L.B., *BP* 9126/02
BIOS 959, 5
FIAT 764 — Diamantphosphin GG
Ullmann & Naef, *Ber.* 33 (1900), 2470
Ullmann & Wenner, *Ber.* 33 (1900), 2476
Ullmann & Marić, *Ber.* 34 (1901), 4308
Benda, *Ber.* 45 (1912), 1796

46040 C.I. Basic Yellow 9 (Greenish yellow)



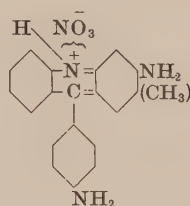
Condense toluene-2,4-diamine (2 mol.) with acetaldehyde (1 mol.), cyclise the product, and oxidise with ferric chloride

Discoverer — I.G. 1922
 BIOS 959, 8
 FIAT 1313, 2, 370
 FIAT 764 — Euchrysin GGNX

Soluble in water (yellow) and ethanol (yellow with a green fluorescence)
 H₂SO₄ conc. — pale yellow with strong green fluorescence; on dilution — reddish yellow
 Aqueous solution + NaOH — yellow ppt.

46045 C.I. Basic Orange 15 (Dull orange → Brown)

Classical names **Phosphine (Chrysaniline)** and **Phosphine E** (methyl analogue)



(a) Remove the main products in the Magenta melt (**C.I.42510**), reduce the residue with zinc, and isolate **Phosphine** as the sparingly soluble nitrate.

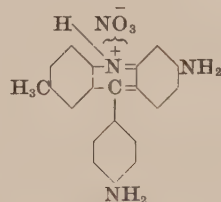
(b) Condense *p*-aminobenzaldehyde with *N*⁴-phenyltoluene-2,4-diamine and oxidise (**Phosphine E**)

Discoverer — Nicholson 1862
 Ewer & Pick, *GP* 29142 (*Fr.* 1, 166)
 Badische Co., *BP* 14920/97, 21496/98; *USP* 617340, 619577; *FP* 267848; *GP* 94951, 102072, (*Fr.* 5, 375, 376)
 FIAT 764 — Phosphin E
 FDX 885
 A. W. Hofmann, *Comp. rend.* 55 (1862), 817; *Wagner's Jahresber.* (1862), 346; *Z. Chem. Ind. Kolloide*, 6 (1863), 33; *Ber.* 2 (1869), 378
 Graebe, *Ber.* 12 (1879), 2241
 O. Fischer & Körner, *Ber.* 17 (1884), 203; *Ann.* 226 (1884), 175
 Anschütz, *Ber.* 17 (1884), 433
 Richardson, *JSDC*, 2 (1886), 41
 Dunstan & Hewitt, *JCS*, 89 (1906), 482, 1472
 Lubs, *The Chemistry of Synthetic Dyes and Pigments*, p. 231 (1955)

Soluble in water and ethanol (reddish yellow with a green fluorescence)
 H₂SO₄ conc. — light reddish yellow with a green fluorescence; on dilution — deep reddish yellow

46050 Basic Dye

Mainly



Probably obtained by a method resembling the Magenta process

For example — React *p*-toluidine and its hydrochloride with *m*-nitroaniline in presence of ferric chloride at 220°C, cyclise, oxidise (*GP* 65985), and convert to the nitrate

Discoverer — M.L.B.

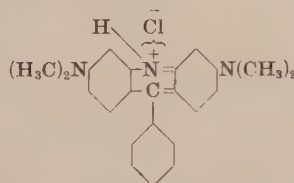
Flavophosphine brands (MLB)

Dyes tannin-mordanted cotton orange

M.L.B., *GP* 65985 (*Fr.* 3, 295), 78377, 79263, 79585, 79877, 81048, (*Fr.* 4, 1036, 1037, 1037, 1038, 1040), 106719 (*Fr.* 5, 377)

Soluble in water (brownish to reddish orange)
 Soluble in ethanol (orange yellow with a strong green fluorescence)
 H₂SO₄ conc. — dark yellow with a strong green fluorescence; on dilution — orange
 Aqueous solution + NaOH — orange flocculent ppt.

46055 Basic Dye



Condense benzaldehyde with *N,N*-dimethyl-*m*-phenylenediamine in ethanol containing hydrochloric acid, cyclise, and oxidise with ferric chloride

Discoverer — Bender 1889

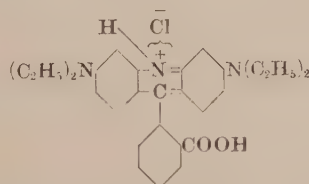
Acridine Orange R (L)

Dyes tannin-mordanted cotton orange

Leonhardt Co., *BP* 8243/90; *USP* 503305; *FP* 205459; *GP* 68908, 70065, 71362, (*Fr.* 3, 293, 293, 294)

Soluble in water (orange yellow) and ethanol (orange yellow with a green fluorescence)
 H₂SO₄ conc. — yellow with a green fluorescence; on dilution — red
 Aqueous solution + NaOH — yellow ppt.

46060 Basic Dye



Condense phthalic anhydride with *m*-diethylaminoacetanilide and acetic anhydride at 140–150°C for 2–3 hr., hydrolyse the product and cyclise by boiling with hydrochloric acid

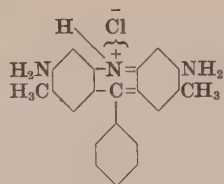
Discoverer — M.L.B. 1889

Flaveosine

Dyes silk from an acid bath golden yellow with a greenish yellow fluorescence. Tannin-mordanted cotton is dyed reddish yellow

M.L.B., *GP* 49850 (*Fr.* 2, 110)
 Majert (methyl compound), *GP* 61867 (*Fr.* 3, 187)
 Lang, *Dissertation*, Zürich, 1908
 Grandmougin & Lang, *Ber.* 42 (1909), 4014

Soluble in water and ethanol (orange with a green fluorescence)
 H₂SO₄ conc. — light yellow with a bluish green fluorescence; on dilution — deep red to orange and then yellowish orange with a green fluorescence
 Aqueous solution + NaOH — light yellow

46065 Basic Dye

Condense benzaldehyde with toluene-2,4-diamine, cyclise, and oxidise with ferric chloride

Discoverer — Rudolf 1887

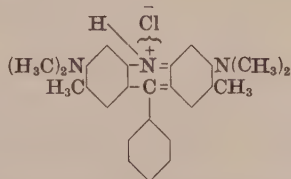
Benzoflavine (GrE)

Dyes cotton yellow, direct or on a tannin-mordant
K. Oehler, *BP* 9614/88; *USP* 382832, 395080; *GP* 43714, 43720, 45294, 45298, (*Fr.* 2, 104, 106, 108)
Bayer Co., *GP* 142453 (*Fr.* 7, 325)
R. Meyer & Gross, *Ber.* 32 (1899), 2352
Hewitt & Fox, *JCS*, 87 (1905), 1058
Dunstan & Cleaverley, *JCS*, 91 (1907), 169

Soluble in water (yellow with a yellowish green fluorescence)
Soluble in ethanol (reddish yellow with a strong greenish yellow fluorescence)
H₂SO₄ conc. — greenish yellow with an intense green fluorescence; on dilution — yellow with orange ppt.

46070 C.I. Basic Orange 18 (Reddish orange)

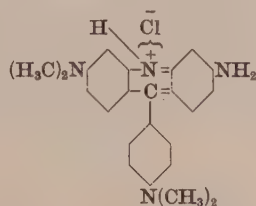
Zinc double chloride of



Condense benzaldehyde with N²,N²-dimethyltoluene-2,4-diamine, cyclise the product, and oxidise with ferric chloride

Discoverer — Rohner Ltd.

Soluble in water (reddish orange) and in ethanol (yellow orange with a green fluorescence)

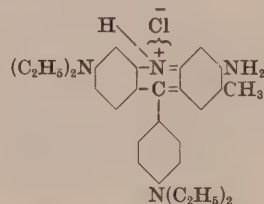
46075 C.I. Basic Orange 23 (Dull yellowish orange)

Heat 4,4'-bis(dimethylamino)benzophenone, *m*-phenylenediamine hydrochloride, and *m*-phenylenediamine at 195–215°C for 4–7 hr., then heat the product with 30% hydrochloric acid at 100°C (*USP* 546177)

Discoverer — Müller 1894

Badische Co., *BP* 1352/95; *USP* 546177; *FP* 244660; *GP* 82989, 85199, (*Fr.* 4, 1173, 1043)
BIOS 959, 11
FIAT 1313, 2, 371
FIAT 764 — Rheonin A
Grandmougin & Lang, *Ber.* 42 (1909), 3634

Soluble in water and ethanol (brownish yellow with a green fluorescence)
H₂SO₄ conc. — brown with a green fluorescence; on dilution — brownish red with an orange red fluorescence
Aqueous solution + NaOH — light brown ppt.

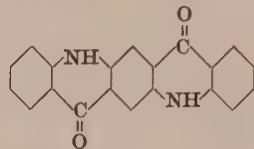
46080 Basic Dye

Heat 4,4'-bis(diethylamino)benzophenone with toluene-2,4-diamine hydrochloride and toluene-2,4-diamine and proceed as in **C.I.46075**

Discoverer — I G.

FIAT 764 — Ledergelb 3G

Solubilities and reactions similar to those of **C.I.46075**

46500 C.I. Pigment Violet 19 (Bright violet)

Heat a dialkyl 2,5-diarylamino-3,6-dihydroterephthalate (alkyl = C_{1–3}) in an inert high-boiling medium and then oxidise

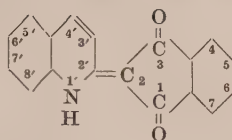
Linear quinacridone exists in three phases: α — bluish red; β — violet and γ — bluish red. By controlling the proportions of alkali, water and solvent used as the medium for oxidation either the β- or γ-phase can be obtained at will

Discoverer — (Pigment form) Du Pont

Du Pont, *BP* 828052, 851976; *USP* 2844484, 2844485, 2844581
Liebermann, *Ann.* 518 (1935), 245

QUINOLINE COLOURING MATTERS

The chromophore of this class is the conjugate system represented by quinophthalone of the structure shown below. This arises when 2- and 4-methylquinolines, derivatives, and analogues are condensed with phthalic anhydride and similar substances. The resulting mainly yellow or red compounds may be used as paper, food, solvent, and basic dyes; when sulfonated they afford valuable acid dyes for wool.



2-(2-Quinolyl)-1,3-indandione

Literature

Hewitt, *Dyestuffs derived from Pyridine, Quinoline, Acridine, and Xanthene*, Longmans, Green & Co., London, 1922

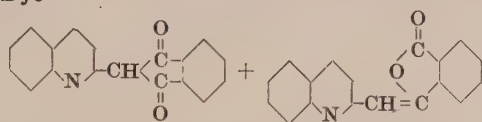
Elderfield, *Heterocyclic Compounds*, Vol. 4, John Wiley, New York, 1952

Kirk-Othmer, *Encyclopedia of Chemical Technology*, Vol. 11, p. 402-405, The Interscience Encyclopedia, New York, 1953

Lubs, *The Chemistry of Synthetic Dyes and Pigments*, Reinhold Publishing Corporation, New York, 1955

47000 C.I. Solvent Yellow 33 (Bright greenish yellow)

Earlier Dye



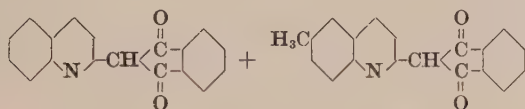
(small amount)

(a) Condense quinaldine with phthalic anhydride at 200°C in presence of zinc chloride

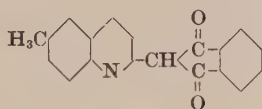
(b) Heat quinaldine with diethyl phthalate and sodium at 100°C

(c) Heat isoquinophthalone (3-(2-quinolylmethylene)phthalide) with sodium ethoxide at 240-250°C

Later Dye



(2 parts)



(1 part)

Heat a mixture of quinaldine and 6-methylquinaldine (*p*-tolu-quinaldine) with phthalic anhydride at 190-220°C

47005 C.I. Acid Yellow 3 (Bright greenish yellow)

C.I. Food Yellow 13 (Bright greenish yellow)

47005:1 (C.I. Pigment Yellow 115) is the aluminium salt

Classical name **Quinoline Yellow**

Quinoline Yellow Extra is a mixture of the di- and trisulfonic acids of Quinoline Yellow Spirit Soluble (Later Dye **C.I.47000**), and

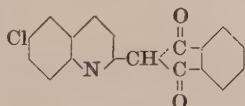
Quinoline Yellow S is a mixture of the mono- and disulfonic acids

The earlier **Quinoline Yellow** is the disulfonated earlier Quinoline Yellow Spirit Soluble

Note — The sulfonic acid groups are in the quinaldine residues

47010 C.I. Acid Yellow 2

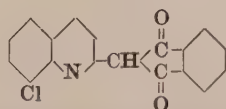
Sulfonated



Condense 6-chloroquinaldine with phthalic anhydride at 210°C, and sulfonate the product

47015 Acid Dye

Sulfonated



Condense 8-chloroquinaldine with phthalic anhydride at 210°C, and sulfonate the product

Discoverer — Jacobsen 1882

Agfa, BP 1362/83; USP 290585; FP 154512; GP 23188, 25144 (Fr. 1, 161, 162)

Eibner, GP 158761 (Fr. 8, 529)

BIOS 1482, 28

FIAT 1313, 2, 384

FIAT 764 — Chinolingelb A spritl.

Traub, Ber. 16 (1883), 297, 878

Jacobsen & Reimer, Ber. 16 (1883), 513, 1082, 2602

Eibner & Lange, Ann. 315 (1901), 303

Eibner, Ber. 34 (1901), 2311; 37 (1904), 3605; Chem. Ztg. 28 (1904), 1206

Eibner & Merkel, Ber. 35 (1902), 2298; 37 (1904), 3006

Eibner & K. Hofmann, Ber. 37 (1904), 3011, 3018

Insoluble in water

Slightly soluble in ethanol (yellow), linseed oil, mineral oil, oleic acid, paraffin wax, stearic acid, turpentine

Soluble in acetone, chloroform, benzene, toluene

H₂SO₄ conc. — yellow brown; on dilution — yellow flocculent ppt.

Discoverer — Jacobsen 1882

Agfa, BP 1362/83; USP 290585; FP 154512; GP 23188, 25144, (Fr. 1, 161, 162)

FIAT 1313, 2, 384

FIAT 764 — Chinolingelb S ex.

Traub, Ber. 16 (1883), 297, 878

Jacobsen & Reimer, Ber. 16 (1883), 513, 1082

JSDC, 1 (1885), 250

Soluble in water and ethanol (yellow)

H₂SO₄ conc. — orange; on dilution — yellow

Aqueous solution + reducing agents — not decolorised

[Distinction from **Picric Acid** (C.I.10305) and **Naphthol Yellow S** (C.I.10316)]

Discoverer — E. Meyer 1907

Bayer Co., BP 28266/07; USP 890588; FP 389036; GP 204255 (Fr. 9, 280)

Soluble in water (greenish yellow)

Discoverers — A. Schmitt and Hoffa 1913

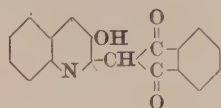
Quinoline Yellow H (MLB)

M.L.B., BP 8577/14; USP 1197632; FP 470181; GP 286237 (Fr. 12, 238)

Soluble in water (greenish yellow)

47020 Acid Dye

Sulfonated



Condense 2-methyl-3-hydroxyquinoline (2-methyl-3-quinolinol) with phthalic anhydride and sulfonate the product

Discoverers — Kränzlein, Schlichenmaier, and Schörnig 1932

Supra Light Yellow GGL (IG)

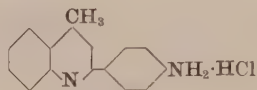
I.G., *BP* 429176; *USP* 2006022; *GP* 619521 (*Fr.* 22, 767);

GP 665599 (*Fr.* 25, 591)

FIAT 1313, 2, 384

FIAT 764 — Supralichtgelb GGL

Soluble in water (yellow)

47025 Basic DyeClassical name **Flavaniline**

(a) Heat acetanilide with zinc chloride at 250–270°C — (O. Fischer & Rudolf)

(b) Heat carboxylic acids of acetanilide with dehydrating agents — (*GP* 21682)

(c) Heat aniline hydrochloride with acetic anhydride at 180–200°C — (*GP* 27948) — or heat acetanilide hydrochloride at 280°C — (Nölting & Weingärtner)

(d) Condense *o*(and *p*)-aminoacetophenone at 100°C in presence of zinc chloride — (O. Fischer)

Discoverers — O. Fischer and Rudolf 1881

Flavaniline (MLB)

M.L.B., *BP* 5427/81, 1724/82; *USP* 256599; *FP* 146298 and addn.; *GP* 19766, 21682, (*Fr.* 1, 164, 164)

Majert, *GP* 28323 (*Fr.* 1, 165)

Baum, *GP* 27948 (*Fr.* 1, 165)

O. Fischer & Rudolf, *Ber.* 15 (1882), 1500; *Chem. Ind.* 5 (1882), 292, 328

Besthorn & O. Fischer, *Ber.* 16 (1883), 68

O. Fischer & Täuber, *Ber.* 17 (1884), 2925

Koechlin, *Dingl.* 253 (1884), 86

Nölting & Weingärtner, *Ber.* 18 (1885), 1340

O. Fischer, *Ber.* 19 (1886), 1036

Meldola, *JSDC*, 2 (1886), 97

Bischler & Burkart, *Ber.* 26 (1893), 1353

Camps, *Ber.* 32 (1899), 3231

Goldschmidt, *Chem. Ztg.* 27 (1903), 279

Soluble in water (yellow)

H₂SO₄ conc. — colourless or faint dull yellow solution with a blue fluorescence

47030 Acid Dye

Sodium salt of the sulfonic acid of Flavaniline

Sulfonate Flavaniline (**C.I.47025**)

Discoverer — M.L.B. 1881

Flavaniline S (MLB)

M.L.B., *BP* 5427/81; *GP* 19766 (*Fr.* 1, 164)

Chem. Ind., 5 (1882), 328

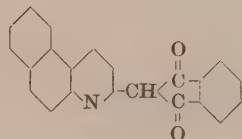
Soluble in water (yellow)

H₂SO₄ conc. — colourless; on dilution — yellow

Aqueous solution + NaOH — decolorised

47035 C.I. Acid Yellow 5 (Bright greenish yellow)**C.I. Direct Yellow 5 (Greenish yellow)**

Disulfonated



Condense β -naphthoquinaldine (3-methylbenzo[*f*]quinoline) with phthalic anhydride and disulfonate with oleum

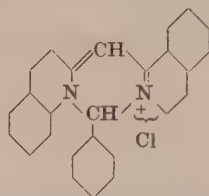
Discoverer — I.G.

FIAT 1313, 2, 386

FIAT 764 — Chinolingelb KT ex. kz.

Very soluble in water (yellow)

H₂SO₄ conc. — yellowish orange; on dilution — greenish yellow

47040 Basic Dye

React benzotrichloride, quinaldine and isoquinoline in molecular proportions at 150°C in the presence of aluminium chloride

Discoverer — Jacobsen 1882

Quinoline Red (A)

Too fugitive to light to be of value for dyeing textiles. Formerly used experimentally in photography for colour-sensitising photographic plates to green and yellow light

Agfa, *BP* 1362/83; *USP* 257717; *FP* 147500, 154512; *GP* 19306, 23967, 40420, (*Fr.* 1, 158, 159, 160)

Vogel, *GP* 39779 (*Fr.* 1, 296)

A. W. Hofmann, *Ber.* 20 (1887), 4

Kranz, *Dissertation*, Jena, 1910; *Chem. Weekbl.* 11 (1914), 364

Vongerichten & Krantz, *Ber.* 43 (1910), 128

Vongerichten & Hofmann, *Ber.* 45 (1912), 3446

Scheibe, *Ber.* 54 (1921), 786

Harris & Pope, *JCS*, 121 (1922), 1029

König, *Ber.* 55 (1922), 3309

Scheibe & Fischer, *Ber.* 59 (1926), 502

Soluble in hot water (red)

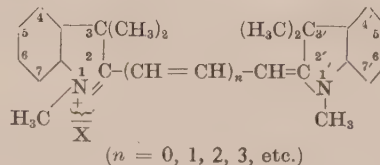
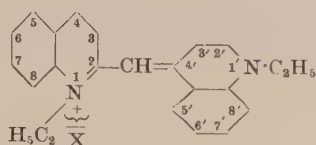
Soluble in ethanol (red with a yellowish red fluorescence)

H₂SO₄ conc. — colourless; on dilution — red

METHINE AND POLYMETHINE COLOURING MATTERS

The chromophore of this group is a conjugate chain of carbon atoms terminated by an ammonium group and, in addition, a nitrogen, sulfur or oxygen atom, or an equivalent unsaturated group. The majority of the dyes contain a quinoline, benzo-thiazole, or trimethylindoline nucleus, and are formed by linking together such nuclei by means of methine or polymethine chains. The dyes are basic in character with an important use in photography as sensitizers but only a limited application in printing or as pigments. This section also contains some miscellaneous dyes of analogous constitution.

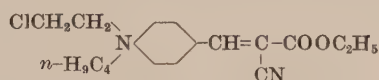
The numbering adopted is —



References

- Fierz-David, *Künstliche Organische Farbstoffe* (1926), 417
 Gilman, *Organic Chemistry*, 3 (1943), 328
 Kirk-Othmer, *Encyclopedia of Chemical Technology*, 4 (1949), 742
 Hamer, *Cyanine Dyes, Quarterly Reviews*, 4 (1950), 327
 Venkataraman, *Synthetic Dyes* (1952), 1143
 Krebs, *PB* 82058, fr. 6121-6160
 Lubs, *The Chemistry of Synthetic Dyes and Pigments* (1955), 248

48000 C.I. Disperse Yellow 31 (Greenish yellow)



Condense ethyl cyanoacetate with *p*-[butyl(2-chloroethyl)amino]-benzaldehyde

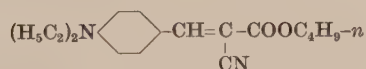
Discoverer — I.G.

I.G., *GP* ap. I 52211

FDX 885 (*PB* 74706)

FIAT 764 — Cellitonechtgelb 7G "F"

48001 Disperse Dye



Condense butyl cyanoacetate with *p*-diethylaminobenzaldehyde

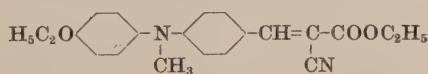
Discoverer — I.G.

Fastness Properties (C): Hot Pressing 4, Light 5, 5-6, 6, Perspiration 4, Washing 3-4

FIAT 1313, 3, 126-127

FIAT 764 — Cellitonechtgelb 3G "F"

48005 C.I. Disperse Yellow 61 (Yellow)



Condense ethyl cyanoacetate with *p*-(*N*-methyl-*p*-phenetidino)-benzaldehyde

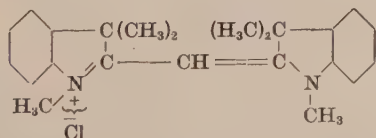
Discoverer — I.G.

Fastness Properties (C): Hot Pressing 4, Light 5, 5-6, 6, Perspiration 4, Washing 3-4

FIAT 1313, 3, 126-127

FIAT 764 — Cellitonechtgelb 3G "F"

48010 Basic Dye



Treat 1,3,3-trimethyl-2-methyleneindoline (Fischer's Base) with sodium nitrite in glacial acetic acid or acetic anhydride, pour into water and salt out

Discoverer — Wahl 1926

Indolenine Yellow (IG)

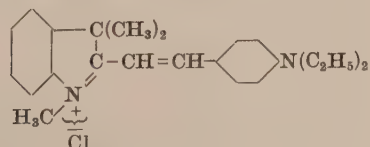
I.G., *GP* 459616 (*Fr.* 16, 864)

E. Fischer, *Ann.* 236 (1886), 128

Kuhn, Winterstein & Balser, *Ber.* 63 B (1930), 3176 (Determination of correct structure)

Soluble in water (yellow)

48013 C.I. Basic Violet 16 (Bright bluish red)



Condense 1,3,3-trimethyl-2-methyleneindoline with *p*-diethylaminobenzaldehyde

Discoverer — I.G.

Formerly used for the manufacture of the phosphotungstomolybdic acid salt, **Fanal Violet 3R** *supra* (IG)

USP 212682

BIOS 1661, 43

FIAT 764 — Rotviolett fuer Fanalfarben

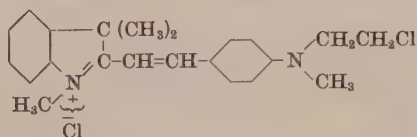
48014 PigmentPhosphotungstomolybdic acid lake of **C.I.48013**

Discoverer — I.G.

Fanal Violet 3R supra (IG)

BIOS 1661, 43

FIAT 764 — Fanalviolett 3R Supra Plv.

48015 C.I. Basic Red 13 (Pink)

Condense 1,3,3-trimethyl-2-methyleneindoline with *p*-[(2-chloroethyl)methylamino]benzaldehyde, and convert to chloride

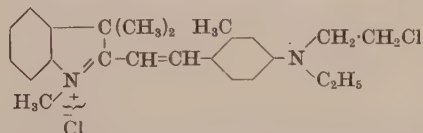
Discoverers — Müller and Berres 1936

BIOS 1088, 20

BIOS-MISC 20, App. 37

FIAT 764 — Astrazonrosa FG

I.G., USP 2179895

48020 C.I. Basic Violet 7 (Bright reddish violet)

Condense 1,3,3-trimethyl-2-methyleneindoline with 4-[(2-chloroethyl)ethylamino]-*o*-tolualdehyde, and convert to chloride

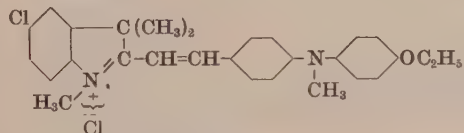
Discoverers — Müller and Berres 1936

BIOS 1088, 20

BIOS-MISC 20, App. 37

FIAT 764 — Astrazonrot 6B

I.G., USP 2179895

48025 Basic Dye

Condense 5-chloro-1,3,3-trimethyl-2-methyleneindoline with *p*-(*N*-methyl-*p*-phenetidino)benzaldehyde

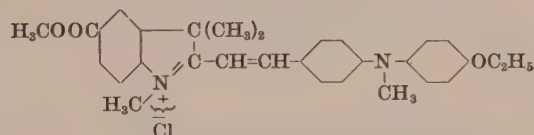
Note — This dye never came on the market

Discoverer — I.G.

Astraphloxine Violet (IG)

FDX 885

FIAT 1313, 3, 268

48030 Basic Dye

Condense 1,3,3-trimethyl-2-methylene-5-indolinecarboxylic acid methyl ester with *p*-(*N*-methyl-*p*-phenetidino)benzaldehyde

Discoverer — I.G. 1938

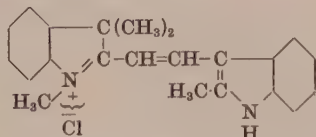
Astrazone Violet R (IG)

Fastness Properties (C): Light 4, Washing 4, Water 4

BIOS 1088, 21

BIOS-MISC 20, App. 37

FDX 885

48035 C.I. Basic Orange 21 (Bright yellowish orange)

Condense 1,3,3-trimethyl-2-methylene-1,2,3-indolineacetaldehyde (Fischer's Aldehyde) with 2-methylindole in hydrochloric acid at 90°C, pour into water, and convert to chloride

Discoverer — I.G. 1938

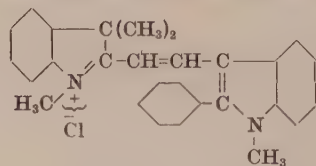
BIOS-MISC 20, App. 37

FDX 885

FIAT 764 — Astrazonorange G

Wolff & Sieglitz, USP 2126852

Vilsmeier & Haack, Ber. 60 (1927), 119

48040 C.I. Basic Orange 22 (Bright orange)

Condense 1,3,3-trimethyl-2-methyleneindoline with 1-methyl-2-phenyl-3-indolecarboxaldehyde in glacial acetic acid at 90°C, pour into water, and convert to chloride

Discoverer — I.G. 1938

I.G., GP 614325 (Fr. 22, 335)

BIOS 1088, 19

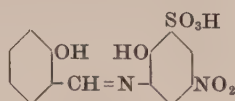
BIOS-MISC 20, App. 37

FDX 885

FIAT 764 — Astrazonorange R

48045 C.I. Solvent Yellow 32 (Bright greenish yellow)

Chromium complex of



Condense salicylaldehyde with 6-amino-4-nitro-1-phenol-2-sulfonic acid and then chrome (one atom of chromium per molecule of dye)

Note — Similar dyes are obtained by replacing the nitro with the chloro or methoxy group

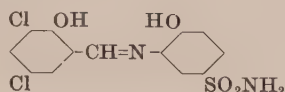
Discoverer — I.G.

FIAT 1313, 3, 270

FIAT 764 — Zaponechtgelb G

Drew & Fairbairn, *JCS* (1939), 823Lubs, *The Chemistry of Synthetic Dyes and Pigments* (1955), 162**48050 Disperse Dye**

Chromium complex of

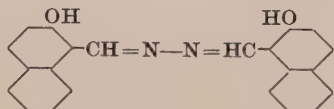


Condense 3,5-dichlorosalicylaldehyde with 2-amino-1-phenol-4-sulfonamide and convert to the half-chromium complex containing one atom of chromium to two molecules of dye

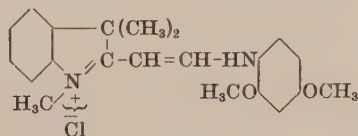
Discoverer — I.G.

Perlon Fast Yellow RS (IG)

BIOS-MISC 20, p. 30

48052 C.I. Pigment Yellow 101 (Bright yellow)

2-Hydroxy-1-naphthaldehyde, azine

48055 C.I. Basic Yellow 11 (Bright yellow)

Condense 1,3,3-trimethyl- Δ^2, α -indolineacetaldehyde with 2,4-dimethoxyaniline

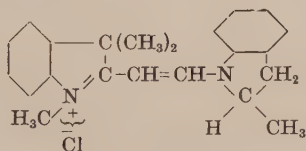
Discoverer — I.G. 1938

I.G., *GP ap.* J53038, *GP* 615130 (*Fr.* 22, 336)

BIOS-MISC 20, App. 37

FDX 885

FIAT 764 — Astrazongelb 3G

48060 Basic Dye

Condense 1,3,3-trimethyl- Δ^2, α -indolineacetaldehyde with 2-methyl-indoline in the presence of phosphorus oxychloride

Discoverer — Wolff 1933

Basic Yellow 52115 (IG)

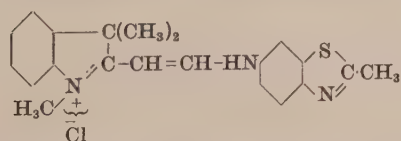
Used with Diamond Green GX (C.I.42040) for the manufacture of the phosphotungstomolybdic acid salt, **Fanal Yellow Green G Supra (IG)**. Compare **C.I. Pigment Green 2**

I.G., *BP* 448936; *USP* 2077063; *GP* 710750 (*Fr.* 25, 615)

BIOS 1661, 48

FDX 885 (*PB* 74719)

FIAT 764 — Basisches Gelb EFCM neu

48065 C.I. Basic Yellow 12 (Bright greenish yellow)

Condense 1,3,3-trimethyl- Δ^2, α -indolineacetaldehyde with 6-amino-2-methylbenzothiazole

Note — The formula with the methine chain attached *para* to the cyclic S, shown on page 11 of the cited BIOS report, and also in FIAT 764, is incorrect

Discoverer — I.G. 1938

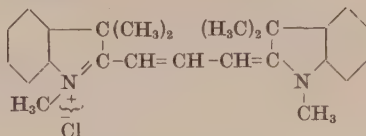
I.G., *GP ap.* J53038, *GP* 615130 (*Fr.* 22, 336)

BIOS-MISC 20, App. 37 (p. 6)

FDX 885

FIAT 764 — Astrazongelb 5G

48070 C.I. Basic Red 12 (Bluish pink)



(a) Condense 1,3,3-trimethyl- Δ^2, α -indolineacetaldehyde with sodium formate in acetic anhydride in the presence of magnesium oxide, add to water and salt out the dye

(b) React 3-methylindole (skatole) with methyl chloride and convert the base to the dye by **orthoformic trimethyl ester**

Discoverer — W. König 1924

Bayer Co., BP 232740, 291888, 312174, 328357, 334706; USP 1524791; FP 578435, 669272, 675316; Sw.P 111134, 111720; 130700, 136391, 137958, 139722; GP 410487, 415534, (Fr. 15, 452, 454)

FDX 885

FIAT 1313, 3, 267

FIAT 764 — Astraphloxin FF ex.

W. König, Ber. 57 (1924), 685

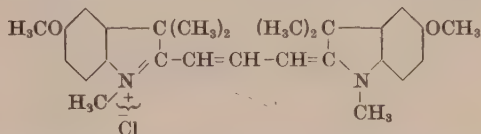
Bull. Soc. chim. 41 (1927), 1049-61

Fierz-David, JSDC, 44 (1928) 156

Fierz-David, Künstliche Organische Farbstoffe, 425

Very soluble in water and ethanol (pink) and in Cellosolve H_2SO_4 conc. — yellowish; on dilution — bluish pink
Aqueous solution + NaOH — bluish pink

48075 Basic Dye



Condense 5-methoxy-1,3,3-trimethyl- Δ^2, α -indolineacetaldehyde with sodium formate in acetic anhydride at 45°C, pour into water and convert to chloride

Discoverer — I.G.

Astra Violet FN extra (IG)

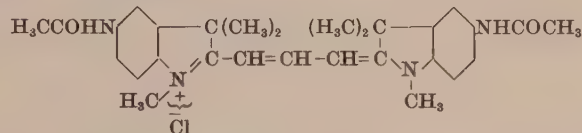
Fastness Properties (C): Light 1, Washing 2

I.G., GP 410487, 415534, (Fr. 15, 452, 454)

FDX 885

FIAT 764 — Astraviolett FN ex.

48080 Basic Dye



Stir 5-amino-1,3,3-trimethyl- Δ^2, α -indolineacetaldehyde and sodium formate for 18 hours at 30°C with acetic anhydride, add the mixture to water, acidify with hydrochloric acid, and salt out the dye

Discoverer — I.G.

Astra Violet FF extra (IG)

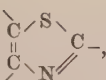
Fastness Properties (C): Light 1, Washing 2

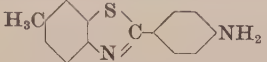
BIOS 1433, 118

FIAT 764 — Astraviolett FF ex.

NOTES

THIAZOLE COLOURING MATTERS

The chromophore of the thiazole dyes is the thiazole ring, , which, when it adjoins an aromatic ring and is bonded at its 2-position with a conjugated system, can give rise to a quinonoid resonance structure. The auxochrome is an amino group. The thiazole ring enhances substantivity, and has been incorporated into the cyanine and sulfurised vat dyes, as well as into azo, anthraquinone, methine and polymethine dyes.

The initial product obtained by heating *p*-toluidine with sulfur is dehydrothio-*p*-toluidine (2-(*p*-aminophenyl)-6-methylbenzothiazole), , which, on further sulfurisation at higher temperatures gives rise to condensation

products — the so-called **Primuline Bases** — whereby more thiazole rings are incorporated. Sulfonation of these products affords yellow direct cotton dyes which may be diazotised on the fibre and coupled *in situ* with amines, phenols, or naphthols, to produce azo dyes in a range of yellow, orange, red and brown hues — the original **Ingrain Colours**. Azo dyes are also made in substance from the aminobenzothiazoles, and are mostly Direct Dyes; they are dealt with in the Azo section of this work.

The thiazole dyes are not destroyed by mild reducing agents, and this property is used in printing to obtain coloured discharges.

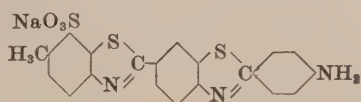
Special Literature

- Bogert *et al.*, *Proc. Natl. Acad. Sci. U.S.* **10** (1924), 318; *Ind. Eng. Chem.* **18** (1926), 532; *JACS*, **49** (1927), 1315;
Coll. Czech. Chem. Commun. **3** (1931), 480
 Fierz-David, *Künstliche Organische Farbstoffe* (1926), 80
 Fierz-David and Brunner, *Helv. Chim. Acta*, **27** (1944), 1
 Schubert, *Ann.* **558** (1947), 10
 Venkataraman, *Synthetic Dyes*, Vol. I (1952), 622
 Lubs, *The Chemistry of Synthetic Dyes and Pigments* (1955), 2 69
 Kirk-Othmer, *Encyc. Chem. Technology*, **14** (1955), 49

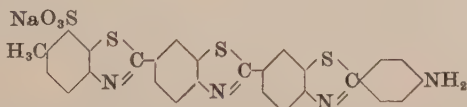
49000 C.I. Direct Yellow 59 (Greenish yellow, direct Red, developed with β -naphthol)

Classical name **Primuline**

Mainly



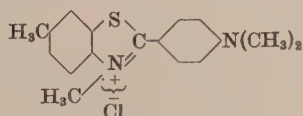
together with some



Heat *p*-toluidine (2 mol.) with sulfur ($4\frac{1}{2}$ atomic proportions) at 200–280°C, and sulfonate the **Primuline Base** formed with oleum

49005 C.I. Basic Yellow 1 (Bright greenish yellow)

49005:1 (C.I. Pigment Yellow 18) is the phosphotungstomolybdic acid salt



Methylate dehydrothio-*p*-toluidine by heating with methanol and hydrochloric or sulfuric acid at 160–170°C under pressure

Discoverer — Green 1887

Bayer Co., *BP* 6319/88; *FP* 190535; *GP* 50525 (*Fr.* **2**, 291)
 Dahl & Co., *BP* 14232/85; *USP* 415359; *FP* 192305; *GP* 35790
 (*Fr.* **1**, 535), 47102 (*Fr.* **2**, 290)
 Green, Cross & Bevan, *BP* 7453/90; *GP* 56606 (*Fr.* **2**, 559)
FIAT 764 — Primulin ECD
 Green, *Dyer*, **7** (1887), 101; **8** (1888), 54; *JSCI*, **7** (1888), 179;
JSDC, **4** (1888), 39; **5** (1889), 81; *Ber.* **22** (1889), 968
 Knecht, *JSDC*, **3** (1887), 174
 Knecht & Hibbert, *JSDC*, **31** (1915), 242
 Green, Cross & Bevan, *JSCI*, **9** (1890), 1001; *Ber.* **23** (1890), 3131; *JSDC*, **7** (1891), 107
 Ruggli & Pestalozzi, *Helv. Chim. Acta*, **9** (1926), 364
 Fierz-David & Brunner, *Helv. Chim. Acta*, **27** (1944), 1
 Schubert, *Ann.* **558** (1947), 10

Soluble in water (pale yellow with blue fluorescence at great dilution)

H₂SO₄ conc. — pale yellow with greenish fluorescence; on dilution — orange yellow ppt.

Discoverers — Green and Lawson 1888
 Rosenheck 1888

Cassella Co., *BP* 6319/88, 14884/88; *USP* 412978; *FP* 190535, 193582; *GP* 51738, 55333, (*Fr.* **2**, 299, 300)
FIAT 764 — Thioflavin TCN
 Green, *JCS*, **55** (1889), 230; *Ber.* **22** (1889), 971; *JSDC*, **33** (1917), 140
 Knecht, *JSDC*, **5** (1889), 107
 Scheurer, *JSCI*, **8** (1889), 608
 Hannay, *JSDC*, **31** (1915), 251

Soluble in cold, very soluble in hot water (yellow)

Readily soluble in ethanol (yellow with green fluorescence)

H₂SO₄ conc. — colourless with dark green fluorescence; on dilution — pale yellow

49010 C.I. Direct Yellow 7 (Greenish yellow)

(a) Methylate **Primuline Base (C.I.49000)** and sulfonate the product (GP 51738)

(b) Sulfonate **Primuline Base** and methylate the product (GP 55333)

Note — **Chromine G (K)**, discovered by Reinhardt in 1888, is an equivalent brand showing slightly modified colour reactions, which was made by a process similar to method (a)

Discoverer — Rosenheck 1888

Cassella Co., *BP* 6319/88, 14884/88; *USP* 412979; *FP* 190535, 193582; *GP* 51738, 55333, (*Fr.* 2, 299, 300)

Kalle Co., *GP* 61204 (*Fr.* 3, 750)

FIAT 764 — Thioflavin S

Knecht, *JSDC*, 5 (1889), 107

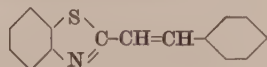
JSDC, 8 (1892), 148

Very soluble in cold and hot water (golden yellow)

Soluble in ethanol (yellow with green fluorescence)

H₂SO₄ conc. — almost colourless with blue fluorescence; on dilution — orange yellow ppt.

49015 C.I. Fluorescent Brightener 41



(a) Condense cinnamoyl chloride with *o*-aminobenzenethiol or its sodium salt in benzene or ethanol

(b) Condense cinnamic acid with *o*-aminobenzenethiol at 210-220°C

(c) Condense 2-methylbenzothiazole with benzaldehyde in presence of zinc chloride

Discoverer — Hofmann 1880

Unitex R S (CIBA)

Hofmann, *Ber.* 13 (1880), 1235

Mills & Whitworth, *JCS* (1927), 2748

Tamamusi & Nagasawa, *J. Pharm. Soc. Japan*, 60 (1940), 127-132; *Chem. Abs.* 34 (1940), 5082

NOTES

INDAMINE AND INDOPHENOL COLOURING MATTERS

The dyes in these two groups are derivatives of quinonanils in which the chromophore is a quinonoid nucleus $-N=\text{C}_6\text{H}_4=N-$ and the auxochromes are respectively amino and hydroxyl groups.

The Indamine dyes are formed either by oxidising an equimolecular mixture of an aromatic *p*-diamine with an aromatic monoamine having a free *para*-position or by the action of a *p*-nitroso-amine on an amine having a free *para*-position.

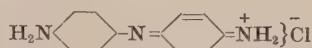
The Indophenols result when a mixture of a phenol and a *p*-aminophenol is oxidised or when a *p*-nitroso-amine reacts with a phenol.

The dyes in neither group are now employed in fibre coloration, but serve as intermediates in the preparation of sulfur dyes and in colour photography.

References

- Fierz-David, *Technologie der Textilfasern*, 298, 303
Mayer, *Chemie der Organischen Farbstoffe*, Vol. 1 (1934), 99
Hodgson and Nicholson, *JCS* (1939), 1405; (1940), 205
Venkataraman, *The Chemistry of Synthetic Dyes*, Vol. 2 (1952), 762
Lubs, *Chemistry of Synthetic Dyes and Pigments* (1955), 263

49400 Basic Dye



(a) Oxidise a mixture of equimolecular proportions of *p*-phenylenediamine and aniline hydrochloride in neutral aqueous solution with potassium dichromate

(b) Oxidise 4,4'-diaminodiphenylamine as (a)

Discoverer — Nietzki 1877

Phenylene Blue

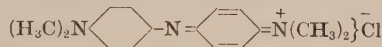
Nietzki, *Ber.* **16** (1883), 464

Soluble in water (greenish blue)

HCl conc. — green solution which decomposes rapidly with formation of *p*-quinone

Reducing agents give 4,4'-diaminodiphenylamine

49405 Basic Dye



and also the zinc double chloride

(a) Oxidise a mixture of *N,N*-dimethyl-*p*-nitrosoaniline hydrochloride and *N,N*-dimethylaniline

(b) Oxidise *N,N*-dimethyl-*p*-phenylenediamine to Wurster's Red and then treat with *N,N*-dimethylaniline

(c) Condense *N,N*-dimethyl-*p*-nitrosoaniline with *N,N*-dimethylaniline

Discoverer — Bindschedler 1879

Bindschedler's Green

Bindschedler, *Ber.* **13** (1880), 208; **16** (1883), 865

Nietzki, *Ber.* **16** (1883), 464

Andresen, *Ber.* **19** (1886), 2212

Willstätter & Piccard, *Ber.* **41** (1908), 1458

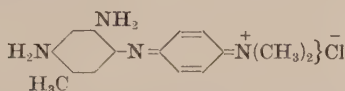
Kehrmann, *Ber.* **41** (1908), 2340

Soluble in water (green)

Insoluble in ethanol

Reduces to 4,4'-bis(dimethylamino)diphenylamine

49410 Basic Dye



(a) Oxidise a mixture of *N,N*-dimethyl-*p*-phenylenediamine and toluene-2,4-diamine

(b) Condense *N,N*-dimethyl-*p*-nitrosoaniline with toluene-2,4-diamine

Discoverer — Witt 1879

Toluyene Blue (cf. C.I. 50435)

Witt, *BP* 4846/80; *USP* 248246; *GP* 15272 (*Fr.* **1**, 274)

Witt, *Ber.* **12** (1879), 931; *JCS*, **35** (1879), 356; *JSCI*, **1** (1882), 256

Nietzki, *Ber.* **16** (1883), 475

Soluble in water and ethanol (blue)

Aqueous solution + NaOH — brown tarry ppt.

Aqueous solution + HCl — reddish brown

49415 C.I. Pigment Green 9 (Bright green)*

Treat 5,6-diamino-1-naphthalenesulfonic acid (*GP* 224443) or 5,6-diamino-4-chloro-1-naphthalenesulfonic acid (*GP* 431943) with ferric salts

Discoverer — M.L.B. 1909 and 1924

M.L.B., *BP* 248487; *USP* 1587435; *GP* 224442 (*Fr.* **10**, 279)

423319 (*Fr.* **15**, 435), 431943

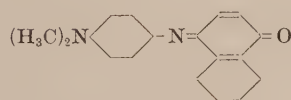
FIAT 764 — Hansagruen GS

Blangey, *Z. angew. Chem.* (1927), 1130

* Barium salt

Soluble in water and ethanol (bluish green)

49700 Vat Dye



(a) React *N,N*-dimethyl-*p*-nitrosoaniline hydrochloride with 1-naphthol

(b) Oxidise a mixture of *N,N*-dimethyl-*p*-phenylenediamine and 1-naphthol with alkaline sodium hypobromite

Discoverer — Köchlin and Witt 1881

Indophenol (DH)

Cassella Co., *BP* 1373/81, 5249/81; *USP* 261518; *FP* 141843

and addn. cf. 10/11/81; *GP* 15915, 18903, 19231, 20850, (*Fr.* **1**, 283, 285, 286)

Ciba, *BP* 7025/03; *USP* 727387; *FP* 330388, 332884; *GP ap.* G18017 (*Fr.* **7**, 332)

Köchlin, *Bull. Soc. ind. Mulhouse*, **52** (1882), 532

Witt, *JSCI*, **1** (1882), 255; *Färberztg.* **1** (1889), 2

Möhlau, *Ber.* **16** (1883), 2851; **18** (1885), 2913

Nölting, *Chem. Ztg.* **13** (1889), 191, 725

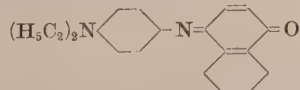
Kertesz, *Chem. Ztg.* **13** (1889), 626

Weiler, *Färberztg.* **2** (1890), 185

Insoluble in water

Soluble in ethanol (blue)

49705 C.I. Solvent Blue 22 (Blue)



Oxidise a mixture of *N,N*-diethyl-*p*-phenylenediamine and 1-naphthol in aqueous alkaline solution by atmospheric oxygen

Discoverer — I.G.

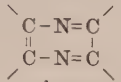
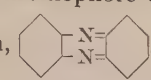
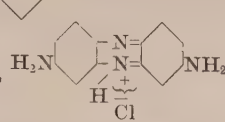
FIAT 764 — Fettblau Z

Insoluble in water

Soluble in ethanol (blue)

NOTES

AZINE COLOURING MATTERS

The chromophore of this class is the pyrazine ring , which links together two benzene rings to form the chromogen, . Auxochromes in *meta*-position to a nitrogen afford the dyes. The simplest member is diaminophenazine hydrochloride, , which is used as a basis for the classification of the great variety of dyes which can

be prepared by replacing the benzene ring by other rings such as naphthalene and phenanthrene, and the *meso*-hydrogen by alkyl or aryl groups. The classification is as follows —

- (1) Quinoxalines, formed by condensation of *o*-quinones with *o*-diamines.
- (2) Eurhodines (and Eurhodoles), which are diaminophenazines (and dihydroxyphenazines).
- (3) Aposafranines, which are monoamino-*meso*-arylphenazines, and are further subdivided into —
 - (a) Phenylaposafranines, (b) Rosindulines (Benzophenylaposafranines), (c) Rosindones (hydroxy in place of amino) and (d) Isorosindulines (the monoamino isomers).
- (4) Safranines, which are diamino-*meso*-arylphenazines and are further subdivided into —
 - (a) Phenyl-, (b) Benzophenyl-, and (c) Dibenzophenyl-safranines.
- (5) Indulines and Nigrosines, which are (arylamino)safranines.

The Azines are basic dyes for wool and silk, and dye cotton on a tannin mordant. The sulfonated derivatives are acid dyes, while many of the non-sulfonated compounds are used in cotton printing and as colours for fats, oils, lacquers, etc.

A bibliography on the constitution of the Azines is included.

General

Literature

Bucherer, *Lehrbuch der Farbenchemie*, Leipzig (1914), 398
 Möhlau-Bucherer, *Farbenchemisches Praktikum*, Leipzig (1920), 245
 Georgievics, *Lehrbuch der Farbenchemie* (1922), 328
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 Mayer, Fritz, *Chemie der organischen Farbstoffe*, Vol. 1 (1934), 109
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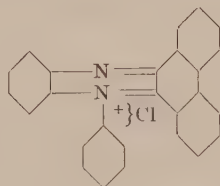
Constitution — A. W. Hofmann & Geyger, *Ber.* 5 (1872), 526. Claus & Raseneck, *Ann.* 168 (1873), 1. Witt, *Ber.* 12 (1879), 939. Bindschedler, *Ber.* 13 (1880), 207. Nietzki, *Ber.* 16 (1883), 464. Hinsberg, *Ber.* 17 (1884), 319; 18 (1885), 1228. Witt, *Ber.* 18 (1885), 1119; 19 (1886), 441, 2791, 3121. Merz, *Ber.* 19 (1886), 725. Bernthsen & Schweitzer, *Ber.* 19 (1886), 2604. Nietzki, *Ber.* 19 (1886), 3017. Witt, *Ber.* 20 (1887), 571. Nietzki & Otto, *Ber.* 21 (1888), 1590. Nietzki & Ernst, *Ber.* 23 (1890), 1854. O. Fischer & Hepp, *Ber.* 23 (1890), 841, 2787; *Ann.* 256 (1890), 233. Kehrman, *Ber.* 23 (1890), 2446. O. Fischer & Hepp, *Ann.* 262 (1891), 238, 249. Kehrman & Messinger, *Ber.* 24 (1891), 584, 2167. O. Fischer & Hepp, *Ann.* 272 (1892), 306. Körner & Schraube, *Chem. Ztg.* 17 (1893), 305. Kehrman, *Ber.* 27 (1894), 3348. O. Fischer & Hepp, *Ber.* 28 (1895), 2283; *Ann.* 286 (1895), 187. Kehrman, *Ber.* 28 (1895), 1709. Jaubert, *Ber.* 28 (1895), 270, 508, 528, 1578. Nietzki, *Ber.* 29 (1896), 1442, 2771. O. Fischer & Hepp, *Ber.* 29 (1896), 361, 1870. Kehrman, *Ber.* 29 (1896), 2316. Jaubert, *Ber.* 29 (1896), 414. O. Fischer & Hepp, *Ber.* 30 (1897), 396, 1891. Kehrman & Schaposchnikoff, *Ber.* 30 (1897), 1565, 2620. Kehrman, Rademacher, & Feder, *Ber.* 31 (1898), 977, 3076. Kehrman, *Ber.* 33 (1900), 395. Kehrman & Ott, *Ber.* 34 (1901), 3092. Kehrman & Nüesch, *Ber.* 34 (1901), 3099. Kehrman, *Ber.* 40 (1907), 2071. Barbier & Sisley, *Ann. Chim. Phys.* 13 (1908), 96. Hewitt, Newman, & Winmill, *JCS*, 95 (1909), 577. Zerewitinoff & Ostromisslensky, *Ber.* 44 (1911), 2402. Balls, Hewitt, & Winmill, *JCS*, 101 (1912), 1840. Kehrman & Havas, *Ber.* 46 (1913), 341. Kehrman, Havas, & Grandmougin, *Ber.* 46 (1913), 2131, 2802. Havas & Bernhard, *Ber.* 46 (1913), 2723. Grandmougin & Smirous, *Ber.* 46 (1913), 3425. Eckert & Steiner, *Monatshft.* 35 (1914), 1153. Kehrman, *Ber.* 50 (1917), 554. Kehrman & Ramm, *Ber.* 51 (1918), 385.

SUB-DIVISIONS

- (1) Quinoxalines (C.I.50000)
- (2) Eurhodines (C.I.50030–50045)
- (3) Aposafranines —
 - (a) Phenylaposafranines (C.I.50050–50055)
 - (b) Rosindulines (C.I.50080–50095)
 - (c) Rosindones (C.I.50120)
 - (d) Isorosindulines (C.I.50150–50165)
- (4) Safranines —
 - (a) Phenylsafranines (C.I.50200–50270)
 - (b) Benzophenylsafranines (C.I.50300–50335)
 - (c) Dibenzophenylsafranines (C.I.50370–50375)
- (5) Indulines and Nigrosines (C.I.50400–50440)

(1) — QUINOXALINES

50000 Basic Dye



Condense phenanthrenequinone with *N*-phenyl-*o*-phenylenediamine in glacial acetic acid

Discoverer — Schraube 1893

Flavinduline O, II (B)

Dyes tannin-mordanted cotton brownish yellow. Formerly had limited use in calico printing and for dyeing leather
Badische Co., *BP* 18374/93; *USP* 543784; *FP* 222863; *GP* 79570 (*Fr.* 4, 397)

Soluble in water (orange yellow)

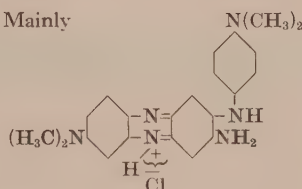
H₂SO₄ conc. — blue red; on dilution — yellow

Aqueous solution + NaOH — yellowish green ppt. changing to greyish yellow

(2) — EURHODINES

50030 Basic Dye

Mainly



Condense *N,N*-dimethyl-*p*-nitrosoaniline hydrochloride with *m*-phenylenediamine; the resulting phenazinium chloride is assumed to react further with *N,N*-dimethyl-*p*-phenylenediamine formed during the reaction

Discoverer — Witt 1879

Neutral Violet (DH) (C)

Dyes tannin-mordanted cotton reddish violet of poor fastness

Witt, *BP* 4846/80; *USP* 248246; *FP* 139715 and addn. of 18/11/80; *GP* 15272 (*Fr.* 1, 274)

Soluble in water (violet red)

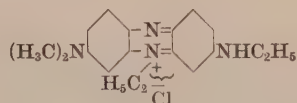
H₂SO₄ conc. — green; on dilution — blue and then violet

HCl conc. — blue

Aqueous solution + NaOH — brown ppt.

50035 Basic Dye

Possibly



React *N,N*-dimethyl(or diethyl)-*p*-nitrosoaniline hydrochloride with *N,N'*-diethyl-*m*-phenylenediamine

Discoverer — Cassella Co. 1890

Fast Neutral Violet B (C)

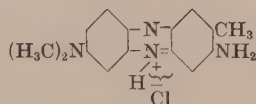
Dyes tannin-mordanted cotton violet of good fastness to light and washing

Cassella Co., *GP* 59063 (*Fr.* 3, 396)

Soluble in water and ethanol (reddish violet)

H₂SO₄ conc. — purple grey; on dilution — blue then bluish violet and finally reddish violet

50040 C.I. Basic Red 5



(a) React *N,N*-dimethyl-*p*-nitrosoaniline hydrochloride with toluene-2,4-diamine, whereby **Toluylene Blue (C.I.49410)** is formed, and heat to cyclise

(b) Oxidise a mixture of *N,N*-dimethyl-*p*-phenylenediamine and toluene-2,4-diamine

Discoverer — Witt 1879

Witt, *BP* 4846/80; *USP* 249136; *FP* 139715 and addn. of 18/11/80; *GP* 15272 (*Fr.* 1, 274)

FIAT 764 — Neutralrot

Witt, *Ber.* 12 (1878), 933

Bernthsen & Schweitzer, *Ann.* 236 (1886), 332; *Ber.* 19 (1886), 2604

Pokorny, *JSDC*, 42 (1926), 347

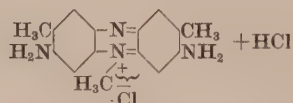
Soluble in water (crimson red)

Soluble in ethanol (magenta red and a faint brownish red fluorescence)

H₂SO₄ conc. — green; on dilution — blue and then magenta red

Aqueous solution + NaOH — yellowish brown ppt.

50045 Basic Dye



React *N,N'*-dimethyltoluene-2,4-diamine with 4-(*o*-tolylazo)-*o*-toluidine hydrochloride, and remove the regenerated *o*-toluidine by steam distillation. A methyl group is eliminated during cyclisation (cf. Cohen & Crabtree)

Discoverer — Leonhardt Co. 1892

Azine Scarlet G (MLB)

Dyes tannin-mordanted cotton red

Leonhardt Co., *GP* 69188 (*Fr.* 3, 397), 86608 (*Fr.* 4, 380)

Cohen & Crabtree, *JCS*, 119 (1921), 2056, 2057

Soluble in water (red)

Soluble in ethanol (fluorescent solution)

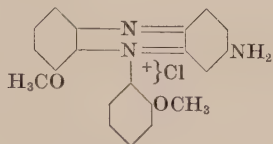
H₂SO₄ conc. — bluish green; on dilution — violet and then red

Aqueous solution + HCl — red or blue with excess

(3) — APOSAFRANINES

(a) Phenylaposafranines

50050 Basic Dye



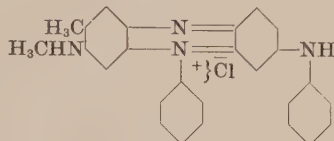
Discoverer — Nietzki 1882

Safranisol (K)

Kalle Co., GP 24229 (Fr. 1, 275)

Oxidise *p*-phenylenediamine (1 mol.) and *o*-anisidine (2 mol.) in hydrochloric acid solution

50055 C.I. Basic Violet 6 (Violet)



Discoverer — Bayer Co.

Patents not known but consult the literature of C.I.50220

BIOS 1433, 44

FDX 885

FIAT 764 — Rhodulinheliotrop 3B

PB 32510 (Trepagnier *et al.*), 68

Oxidise a solution of *N*-phenyl-*p*-phenylenediamine and *N*-methyl-*o*-toluidine in hydrochloric acid, and further oxidise the product with aniline hydrochloride

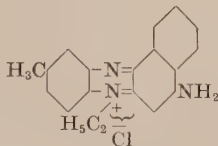
Soluble in water and ethanol (red violet)

H₂SO₄ conc. — olive green; on dilution — red violet

Aqueous solution + NaOH — corinth with ppt.

(b) Rosindulines

50080 Basic Dye



Discoverer — Schraube 1892

Induline Scarlet (B)

Dyes tannin-mordanted cotton scarlet. Formerly used in discharge printing

Badische Co., BP 10138/92, 10138A/92; USP 533829; FP 222863, 355117 addn. of 14/5/06; GP 66361 (Fr. 3, 352), 77226

(Fr. 4, 383), 184381 (Fr. 8, 884)

Soluble in water (red)

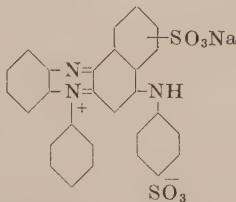
Soluble in ethanol (orange red with a yellow fluorescence)

H₂SO₄ conc. — wine red; on dilution — green and then red

Aqueous solution + NaOH — violet resinous ppt.

Heat *N*-ethyl-2-phenylazo-*p*-toluidine with 1-naphthylamine hydrochloride in a diluent such as phenol

50085 C.I. Acid Red 101 (Bluish red)



Discoverer — Schraube 1888

Badische Co., BP 15259/88, 6875/90, 5540/92; USP 428530, 430975, 431404; GP 45370 (Fr. 2, 202)

S.A. St. Denis, BP 182084, 191064, 206142, 206150, 206488, 246482; USP 155535, 1599444; FP 558157, 560017; GP 415317, 415318, 415319, 415320, 422119, (Fr. 15, 309 310, 315, 316, 433)

BIOS 959, 3 discloses this dye *incorrectly* as a monosulfonated product

FIAT 764 — Azocarmin GX "F"

O. Fischer & Hepp, Ber. 21 (1888), 2621; Ann. 256 (1890), 240; 262 (1891), 237

Knecht, JSDC, 5 (1889), 106

Kehrmann & Messinger, Ber. 24 (1891), 588

Lantz & Wahl, Compt. rend. 182 (1926), 705; Bull. Soc. chim. 39 (1926), 586; Chim. & Ind. 16 (1926), 355

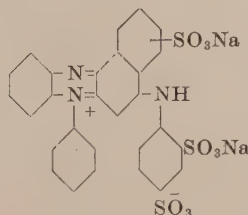
Slightly soluble in water (bluish red)

H₂SO₄ conc. — green; on dilution — red ppt.

Aqueous solution + HCl — red ppt. Soluble in water

Heat 4-phenylazo-1-naphthylamine with aniline and aniline hydrochloride, whereby phenylrosinduline (Rhodindine) is formed, disulfonate with oleum, and isolate as the sodium salt

50090 C.I. Acid Red 103 (Bluish red)



Discoverers — Hepp 1888; Schraube 1890

Azo Carmine BX (B)

Badische Co., BP 19167/90; GP 58601 (Fr. 3, 329)

Kalle Co., USP 466826

JSDC, 8 (1892), 90; 9 (1893), 14

BIOS 959, 3 discloses this dye *incorrectly* as a disulfonated product

FIAT 764 — Azocarmin BX

Very soluble in water (bluish red)

H₂SO₄ conc. — green; on dilution — brown ppt.

Aqueous solution + HCl — brown ppt.

Sulfonate Azocarmin GX (C.I.50085) to the trisulfonic acid with 24% oleum at 70–80°C, and isolate as the acid disodium salt

50095 Basic Dye

Possibly an aminophenylrosinduline chloride

(a) Heat 4-(1-naphthylazo)-1-naphthylamine (or 4-phenylazo-1-naphthylamine) with *p*-phenylenediamine in presence of benzoic acid at 180–190°C (GP 45803)

(b) Heat *p*-phenylazoaniline hydrochloride with 1-naphthylamine and then condense the product with *p*-phenylenediamine in presence of benzoic acid at 180°C until a sample is soluble in dilute hydrochloric acid (GP 57346)

Discoverer — Elsässer 1888

Paraphenylene Violet (WDC)

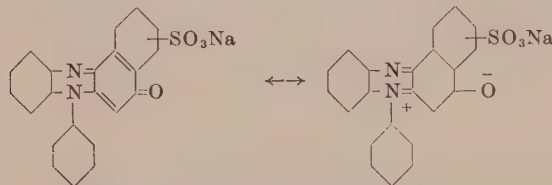
Dyes tannin-mordanted cotton violet of moderate fastness to acids, alkalies, light and washing

Dahl Co., *FP* 191151; *GP* 45803 (*Fr.* 2, 209), 57346, 69096 (*Fr.* 3, 313, 314)

Soluble in water (violet)

H₂SO₄ conc. — bluish violet; on dilution — blue then violet

Aqueous solution + NaOH — brownish violet ppt.

(c) Rosindones**50120 C.I. Acid Orange 15 (Reddish orange)**

(a) Heat **C.I.50090** (the acid disodium salt) with water or dilute acids at 160–180°C under pressure, whereby a monosulfonic acid of rosindone is formed, and convert into the sodium salt

(b) Heat **C.I.50090** in weak alkaline solution whereby 4-amino-*m*-benzenedisulfonic acid (disodium salt) is split off

Discoverer — Hepp 1890

Rosinduline G G (K)

Kalle Co., *GP* 67198, 72343, (*Fr.* 3, 346, 346)

JSDC, 8 (1892), 90

BIOS 959, 13

BIOS 1433, 73

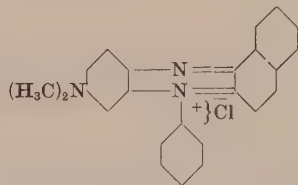
FIAT 764 — Rosindulin GG

FDX 885

Fischer & Hepp, *Ann.* 286 (1895), 216

Soluble in water (scarlet red)

H₂SO₄ conc. — dull green; on dilution — brownish ppt.

(d) Isorosindulines**50150 Basic Dye**

React *N,N*-dimethyl-*p*-nitrosoaniline hydrochloride with *N*-phenyl-2-naphthylamine

Discoverer — Witt 1882

Neutral Blue (MLy) (C)

Dyes tannin-mordanted cotton dull blue of poor fastness to light and washing

Witt, *GP* 19224 (*Fr.* 1, 277)

Witt, *Ber.* 21 (1888), 723

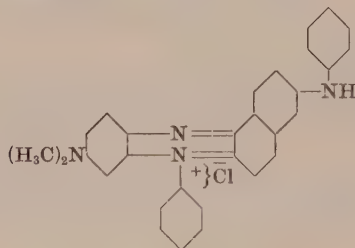
Nietzki & Otto, *Ber.* 21 (1888), 1598

Soluble in water (violet)

Soluble in ethanol (reddish violet)

H₂SO₄ conc. — brownish violet; on dilution — violet

Aqueous solution + NaOH — violet ppt.

50155 Basic Dye

React *N,N*-dimethyl-*p*-nitrosoaniline hydrochloride with *N,N'*-diphenyl-2,6-naphthalenediamine in boiling ethanolic solution

Discoverer — Bender 1889

Azine Green GB (L)

Dyes tannin-mordanted cotton dark bluish green of moderate fastness to light and washing

Leonhardt Co., *BP* 3098/90; *GP* 54087 (*Fr.* 2, 182)

Soluble in water and ethanol (green)

H₂SO₄ conc. — brownish; on dilution — green

Aqueous solution + NaOH — green ppt.

50156 Acid Dye

Sulfonate Azine Green GB (**C.I.50155**) and convert the product into the sodium salt

Discoverer — Bender 1890

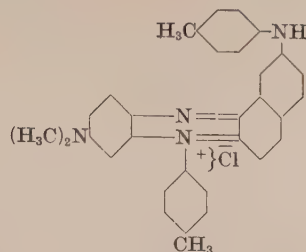
Azine Green S (L)

Dyes wool in presence of acid. Light fastness, good
Leonhardt Co., *GP* 58576 (*Fr.* 3, 323)

H₂SO₄ conc. — bluish violet; on dilution — brownish and then bluish green

Soluble in water (bluish green)

Almost insoluble in ethanol

50160 Basic Dye

React *N,N*-dimethyl-*p*-nitrosoaniline hydrochloride with *N,N'*-di-*p*-tolyl-2,7-naphthalenediamine

Discoverer — Annaheim 1886

Basle Blue R (DH)

Dyes wool reddish blue from an acid or alkaline bath and tannin-mordanted cotton blue

Durand & Huguenin *BP* 14283/86; *USP* 369764; *FP* 178364; *GP* 40886 (*Fr.* 1, 278)

Annaheim, *Ber.* 20 (1887), 1371

O. Fischer & Hepp, *Ann.* 272 (1892), 325

Soluble in water (bluish violet)

H₂SO₄ conc. — greenish brown; on dilution — green then violet and bluish violet ppt.

Aqueous solution + HCl — blue black ppt.

50161 Acid Dye

Sulfonate **C.I.50160** with 20–25 % oleum and convert the product into the sodium salt

H₂SO₄ conc. — yellow; on dilution — green and then blue

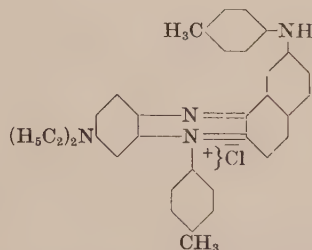
Discoverers — Durand and Huguenin 1890

Basle Blue S (DH)

Dyes wool and silk in the presence of acid. Light fastness, good

Durand & Huguenin, *FP* 178364; *GP* 58363 (*Fr.* 3, 321)

Soluble in water (blue)

50165 Basic Dye

React *N,N*-diethyl-*p*-nitrosoaniline hydrochloride with *N,N'*-di-*p*-tolyl-2,7-naphthalenediamine

Discoverer — Annaheim 1886

Basle Blue BB (DH)

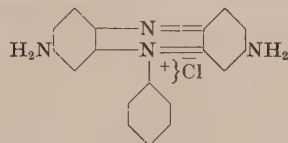
References as for **C.I.50160**

Soluble in water (bluish violet)

H₂SO₄ conc. — olive brown; on dilution — green then violet and bluish violet ppt.

(4) — SAFRANINES**(a) Phenylsafranines****50200****Basic Dye**

Classical name — **Phenosafranin**



(a) Oxidise a mixture of *p*-phenylenediamine (1 mol.) with aniline hydrochloride (2 mol.)

(b) Oxidise equimolecular proportions of 4,4'-diaminodiphenylamine and aniline; then convert to the chloride

H₂SO₄ conc. — green; on dilution — blue, violet and then red
Aqueous solution + NaOH — reddish brown ppt. soluble in much water

Discoverer — Witt 1878

Safranin B extra (B)

Dyes tannin-mordanted cotton bluish red. Exerts a desensitising action on photographic emulsions

Williams, Thomas, & Dower. Catalogue of the Paris Exhibition of 1878

Witt, *Ber.* 12 (1879), 939; 19 (1886), 3121

Bindschedler, *Ber.* 13 (1880), 207; 16 (1883), 870

Bernthsen, *Ber.* 19 (1886), 2690

Andresen, *Ber.* 19 (1886), 2212

Barbier & Vignon, *Bull. Soc. chim.* 48 (1887), 338, 771; *Compt. rend.* 105 (1887), 939

Nietzki & Otto, *Ber.* 21 (1888), 1593

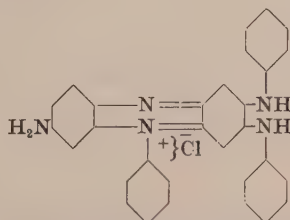
O. Fischer & Hepp, *Ber.* 26 (1893), 1655

Miolati, *Ber.* 28 (1895), 1697

Kehrmann, *Ber.* 29 (1896), 2316

Soluble in water (red)

Soluble in ethanol (red with a greenish yellow fluorescence)

50204**Basic Dye**

Heat *p*-phenylazoaniline with a large proportion of aniline hydrochloride for a limited period

Discoverers — Ullrich 1888; Homolka 1888

Indamine Blue B, R (MLB)

Dyes tannin-mordanted cotton bluish violet

M.L.B., *BP* 16325/88; *USP* 418916; *FP* 197490; *GP* 50534, 50819, 54657, (*Fr.* 2, 195, 197, 200; 3, 313)

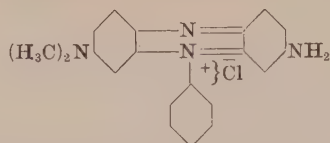
Ullrich, *Chem. Ztg.* (1890), 375; cf. *JSDC*, 6 (1890), 96

O. Fischer & Hepp, *Ann.* 262 (1891), 256; *Ber.* 28 (1895), 2288; 29 (1896), 368; 33 (1900), 1498

Soluble in water (bluish violet)

H₂SO₄ conc. — blue; on dilution — redder and blue ppt.

Aqueous solution + NaOH — dark reddish violet ppt.

50205 C.I. Basic Violet 5 (Bright reddish violet)

(a) Oxidise a mixture of *N,N*-dimethyl-*p*-phenylenediamine and aniline; then convert to the chloride

(b) Heat *N,N*-dimethyl-*p*-nitrosoaniline hydrochloride with *N*-phenyl-*m*-phenylenediamine

Discoverer — Ullrich 1887

Bindschedler, *Ber.* **13** (1880), 208; **16** (1883), 869

Nietzki, *Ber.* **16** (1883), 464

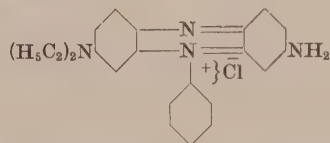
Körner & Schraube, *Chem. Ztg.* **17** (1893), 305

Hannay, *JSDC*, **31** (1915), 249

Cobenzl, *Chem. Ztg.* **50** (1926), 494

Soluble in cold and hot water (magenta)

Very soluble in ethanol (violet red) and Cellosolve
H₂SO₄ conc. — green; on dilution — blue then violet
Aqueous solution + NaOH — brownish red ppt.

50206 Basic Dye

Oxidise a mixture of *N,N*-diethyl-*p*-phenylenediamine and aniline

BIOS 1433, 45

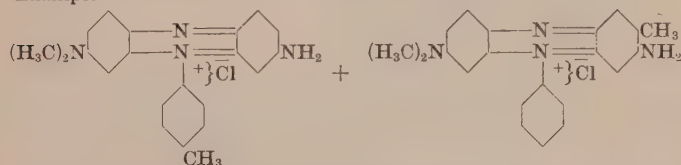
FDX 885 and FIAT 764 — Methylenviolett 3RAX kz.

Used as a diazo-component for the manufacture of Basic Azo dyes, e.g. **C.I.11050, 11090**

See Phenazinium chloride, 3-amino-7-diethylamino-5-phenyl (Intermediates section)

50210 C.I. Basic Violet 8 (Bright reddish violet)

Example

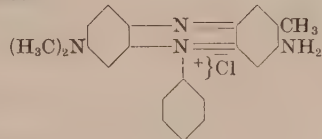


Oxidise a mixture of *N,N*-dimethyl-*p*-phenylenediamine, aniline hydrochloride and *o*(or *p*)-toluidine

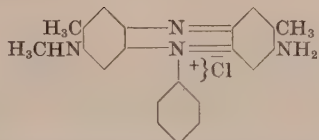
Discoverers — Various Firms

Soluble in water (reddish violet)

Soluble in ethanol (reddish violet with an orange fluorescence)
H₂SO₄ conc. — green; on dilution — blue then reddish violet
Aqueous solution + NaOH — soluble dark red ppt.

**50215 Basic Dye
Rhoduline Violet**

Rhoduline Red G



React *N*⁴-phenyltoluene-2,4-diamine with *N,N*-dimethyl-*p*-nitrosoaniline hydrochloride (for **Rhoduline Violet**) and with *N*-methyl-4-nitroso-*o*-toluidine hydrochloride (for **Rhoduline Red G**)

Discoverer — Reyher 1894

Rhoduline Violet (By) and Rhoduline Red G, GD (By)

Dye tannin-mordanted cotton bluish reds of good fastness to washing

FDX 885 — Rhodulinrot G

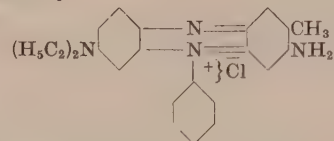
Bayer Co., BP 9610/94, 2041/95, 6176/95; USP 543894, 557022, 559063; FP 240621; GP 81963, 84442, 84504, 84992, (*Fr.* **4**, 412, 419, 414, 416)

Solubility and reactions similar for each dye

Soluble in water (red)

Soluble in ethanol (red to brown fluorescence)

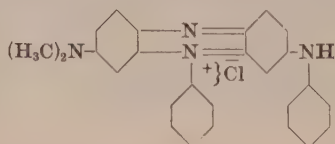
H₂SO₄ conc. — green; on dilution — blue to violet and then red
Aqueous solution + NaOH — brown ppt.

50216 Basic Dye

React *N*⁴-phenyltoluene-2,4-diamine with *N,N*-diethyl-*p*-nitrosoaniline hydrochloride

Used as a diazo-component for the manufacture of Basic Azo dyes, e.g. **C.I.11975, 12211**

See Phenazinium chloride, 3-amino-7-diethylamino-2-methyl-5-phenyl (Intermediates section)

50220 Basic Dye (Bright greenish blue)

Condense *N,N'*-diphenyl-*m*-phenylenediamine (obtained from aniline and resorcinol) with *N,N*-dimethyl-*p*-nitrosoaniline hydrochloride in ethanolic solution

Discoverer — Bayer Co.

Rhoduline Blue GG Extra (By)

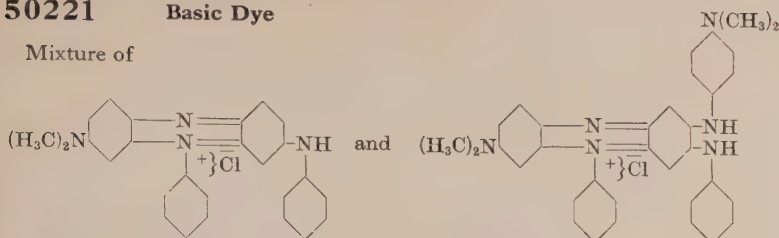
Compare Bayer Co., BP 9610/94; FP 240621; GP 81963 (*Fr.* **4**, 412)

Very soluble in water and ethanol (violet)

H₂SO₄ conc. — green grey; on dilution — cornflower blue
Aqueous solution + NaOH — corinth with ppt.

50221 Basic Dye

Mixture of



React 3 molecular proportions of *N,N*-dimethyl (in some brands diethyl)-*p*-nitrosoaniline hydrochloride with 2 molecular proportions of *N,N'*-diphenyl-*m*-phenylenediamine

Discoverer — Weinberg 1888

Indazine GB, L, M, P (C)

Dyes tannin-mordanted cotton bright indigo blues of good fastness to washing

FDX 885 — Indazine M

Cassella Co., *BP* 5852/88; *USP* 395300; *FP* 190091; *GP* 47549 (*Fr.* 2, 181)

Knecht, *JSDC*, 5 (1889), 106

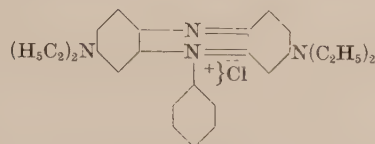
O. Fischer & Hepp, *Ann.* 262 (1891), 263; 272 (1893), 314; 286 (1895), 203; *Ber.* 26 (1893), 1195

Thorpe-Linstead, p. 293

Soluble in water and ethanol (violet blue)

 H_2SO_4 conc. — blackish green; on dilution — blue

Aqueous solution + NaOH — blackish blue ppt.

50225 Basic Dye

Oxidise equimolecular proportions of *N,N*-diethyl-*p*-phenylenediamine, *N,N*-diethylaniline, and aniline hydrochloride

Discoverer — Nietzki 1883

Heliotrope B, 2B (K)*

Dyes silk violet with red fluorescence

Nietzki, *Ber.* 16 (1883), 472; *Chem. Ind.* 6 (1888), 197Cobenzl, *Chem. Ztg.* 50 (1926), 494

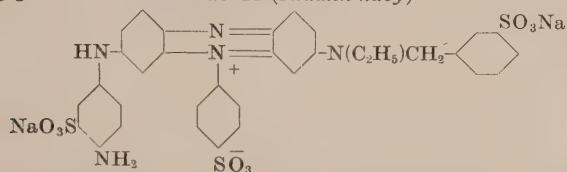
Soluble in water (reddish violet)

Soluble in ethanol (magenta red with a bluish red fluorescence)

 H_2SO_4 conc. — green; on dilution — blue and then bluish violet

Aqueous solution + HCl — blue

*Note — A disazo dye was marketed under the same names by several German firms other than Kalle

50230 C.I. Acid Blue 18 (Reddish navy)

Oxidise equimolecular proportions of 2-amino-5-(*p*-nitroanilino)-benzenesulfonic acid, α -(*N*-ethylanilino)-*m*-toluenesulfonic acid and sulfanilic acid with sodium dichromate and sulfuric acid; further oxidise the product with sulfanilic acid, and reduce with iron filings (*FIAT* 1313, 2, 378)

Discoverer — Heimann 1906

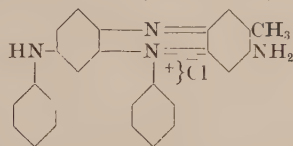
Agfa, *USP* 872815; *FP* 374832, 374833, 388188, cf. 573368; *GP* 186597, 186598, 193472, (*Fr.* 9, 259, 261, 263)

FIAT 1313, 2, 378*FIAT* 764 — Saeurecyanin BF

Soluble in cold and hot water (blue) and in ethanol (blue)

 H_2SO_4 conc. — green; on dilution — blue to reddish violet

Aqueous solution + NaOH — marine blue with ppt.

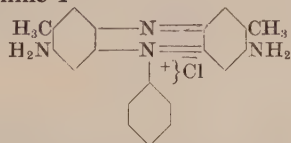
50235 C.I. Basic Violet 12 (Bright violet)

Oxidise equimolecular proportions of *N*-phenyl-*p*-phenylenediamine, aniline, and *o*-toluidine; then convert to the chloride

Discoverer — Cobenzl 1888

M.L.B., *GP* 49853 (*Fr.* 2, 161)Cobenzl, *Chem. Ztg.* 50 (1926), 495

Slightly soluble in water (reddish violet) and ethanol

 H_2SO_4 conc. — green; on dilution — blue and then red**50240 C.I. Basic Red 2 (Bright bluish pink)**Classical name **Safranin T**

Oxidise equimolecular proportions of toluene-2,5-diamine and *o*-toluidine, condense the product with aniline and purify the dye by fractional precipitations; then convert to the chloride

Also an intermediate for **C.I. 12210**

Kehrmann, *Ber.* 27 (1894), 3349; 28 (1895), 1709; 29 (1896) 2316; *Ann.* 290 (1896), 247

Jaubert, *Ber.* 28 (1895), 270, 508, 1581; 29 (1896), 414Miolati, *Ber.* 28 (1895), 1697O. Fischer, *Ber.* 29 (1896), 1870Kehrmann & Wetter, *Ber.* 31 (1898), 966Knecht, *JSDC*, 21 (1905), 294Barbier & Sisley, *Ann. Chim. Phys.* 13 (1908) (8), 96Hewitt, Newman, & Winmill, *JCS*, 95 (1909), 577Havas & Bernhard, *Ber.* 46 (1913), 2723Hannay, *JSDC*, 31 (1915), 249

Soluble in water (red)

Soluble in ethanol (red with a yellowish red fluorescence)

 H_2SO_4 conc. — green; on dilution — blue and then red

Aqueous solution + NaOH — brownish red ppt;

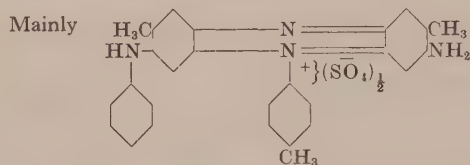
+ HCl — bluish violet

Discoverer — Greville Williams 1859

Greville Williams, *BP* 1090/59Price, *BP* 1288/59Duprey, *USP* 1183711; *FP* 69809Agfa, *GP* ap. A24294 (*Fr.* 12, 891)*BIOS* 1433, 4. *FIAT* 1313, 2, 376*FIAT* 764 — Safranin T ex. kz.Willm, *Bull. Soc. ind. Mulhouse*, 30 (1860), 360Perkin, *JCS*, 14 (1862), 235; 35 (1879), 729Mène, *Chem. News*, 25 (1872), 215A. W. Hofmann & Geyger, *Ber.* 5 (1872), 526Nietzki, *Ber.* 10 (1877), 668; 16 (1883), 465, 476; 17 (1884), 226;

19 (1886), 3017, 3163; 28 (1895), 1354; 29 (1896), 1442

Dale & Schorlemmer, *JCS*, 35 (1879), 682Witt, *Ber.* 12 (1879), 939; 19 (1886), 3121; 21 (1888), 719Bindschedler, *Ber.* 13 (1880), 207; 16 (1883), 864, 872Andresen, *Ber.* 19 (1886), 2212Bernthsen & Schweitzer, *Ber.* 19 (1886), 2604; *Ann.* 236 (1886), 332Bernthsen, *Ber.* 19 (1886), 2690; 20 (1887), 179Barbier & Vignon, *Compt. rend.* 105 (1887), 939; *Bull. Soc. chim.* 48 (1887), 338, 771Mülhäuser, *Mon. sci.* Jan. 1887; cf. *JSDC*, 3 (1887), 45Nietzki & Otto, *Ber.* 21 (1888), 1590, 1737Kehrmann & Messinger, *Ber.* 24 (1891), 584, 2167Trillat, *Compt. rend.* 116 (1893), 1382O. Fischer & Hepp, *Ber.* 26 (1893), 1195, 1655; 28 (1895), 2283; 29 (1896), 361; *Ann.* 286 (1895), 211Körner & Schraube, *Chem. Ztg.* 17 (1893), 305Ris, *Ber.* 27 (1894), 3318

50245 Basic DyeClassical name **Mauve, Mauveine**

Oxidise aniline containing *o*- and *p*-toluidines with potassium dichromate in cold dilute sulfuric acid solution

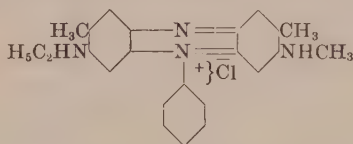
H₂SO₄ conc. — olive green; on dilution — green to blue and then reddish violet
Aqueous solution + NaOH — bluish violet ppt.

Discoverer — W. H. Perkin 1856

Mauve, Mauveine

Dyes silk reddish violet and cotton violet
Perkin, *BP* 1984/56
Dale & Caro, *BP* 1307/60
Willm, *Bull. Soc. ind. Mulhouse*, **30** (1860), 366
Schlumberger, *Bull. Soc. ind. Mulhouse*, **32** (1862), 126; *Dingl.* **164** (1862), 206
Perkin, *JCS*, **14** (1862), 232; *Proc. Roy. Soc.* **12** (1863), 713; *Ann.* **131** (1864), 201; *JCS*, **22** (1869), 25; **35** (1879), 717
O. Fisher & Hepp, *Ber.* **21** (1888), 2620; **26** (1893), 1194
JSDC, **22** (1906), 330 (pattern of Perkin's Mauve)
Hibbert, *JSDC*, **37** (1921), 187
Cobenzl, *Öst. Chem. Ztg.* **28** (1925), 28

Insoluble in cold and sparingly soluble in hot water (red violet)
Soluble in ethanol (purple)

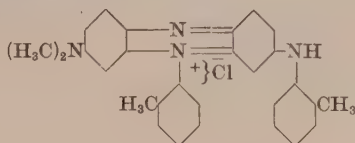
50250 C.I. Basic Red 10 (Bright bluish pink)

(a) Oxidise aniline with the indamine obtained by the oxidation of *N*²-ethyltoluene-2,5-diamine and *N*-methyl-*o*-toluidine (*GP* 88954)
(b) React *N*-methyl-4-nitroso-*o*-toluidine hydrochloride with *N*²-ethyl-*N*⁴-phenyltoluene-2,4-diamine (*GP* 81963)

Discoverers — Reyher and Heymann 1894

Bayer Co., *BP* 9610/94, 2900/95, 9794/95; *USP* 592608; *FP* 240621, 245641; *GP* 81963, 87975, 88954, (*Fr.* **4**, 412, 418, 404)

Soluble in water (bluish red) and in ethanol (bluish red with an orange fluorescence)
H₂SO₄ conc. — green; on dilution — blue to violet and then bluish red
Aqueous solution + NaOH — brown flocculent ppt.

50255 Basic Dye

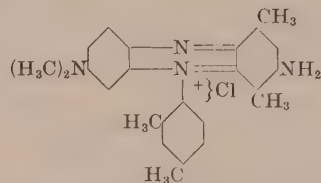
React *N,N*-dimethyl-*p*-nitrosoaniline hydrochloride with '*N,N*'-di-*o*-tolyl-*m*-phenylenediamine

Discoverer — Weinberg 1888

Metaphenylene Blue B, BB, BBR (C)

Dyes tannin-mordanted cotton blackish-, reddish-, or greenish-blue
Cassella Co., *BP* 5852/88; *USP* 395300; *FP* 190091; *GP* 47549 (*Fr.* **2**, 181)

Soluble in water (bluish violet) and ethanol (blue)
H₂SO₄ conc. — bluish grey; on dilution — bluish grey to blue
Aqueous solution + NaOH — violet ppt.

50260 Basic Dye

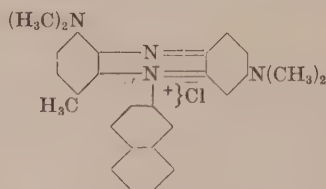
React *N,N*-dimethyl-*p*-nitrosoaniline hydrochloride with a mixture of the hydrochlorides of 2,4 (and 2,5)-xylidine

Discoverer — Cobenzl 1926

Tannin Heliotrope (C), Giroflé (DH)

Dyes tannin-mordanted cotton reddish violet of good fastness to light and washing
Cobenzl, *Chem. Ztg.* **50** (1926), 494

Soluble in water and ethanol (magenta red)
H₂SO₄ conc. — green; on dilution — blue to red
Aqueous solution + NaOH — red ppt, soluble in water

50265 Basic Dye

React *N,N*-dimethyl-*p*-nitrosoaniline hydrochloride with the compound (*N*⁴,*N*⁴-dimethyl-*N*²-(2-naphthyl)toluene-2,4-diamine) obtained by condensing *N*⁴,*N*⁴-dimethyltoluene-2,4-diamine with 2-naphthol

Discoverer — M.L.B. 1895

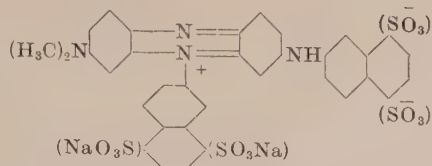
Ethyl Blue BD, BF, RD (MLB)

Formerly used in calico printing for indigo blues
M.L.B., *GP* 89659 (*Fr.* **4**, 379)

Soluble in water (violet) and ethanol (bluish violet)
H₂SO₄ conc. — green; on dilution — blue to bluish violet
Aqueous solution + NaOH — violet ppt.

50270

Acid Dye



React *N,N*-dimethyl-*p*-nitrosoaniline hydrochloride with 6,6'-(or 7,7')-(*m*-phenylenediimino)di-1-naphthalenesulfonic acid

Discoverer — Elsässer 1892

Naphthazine Blue (MLB) (WDC)

Dyes wool in the presence of acid

Fastness Properties: Light, moderate; Milling, moderate
Dahl Co., BP 18958/93; USP 524677; FP 233265; GP 77227
(Fr. 3, 324)
JSDC, 9 (1893), 127

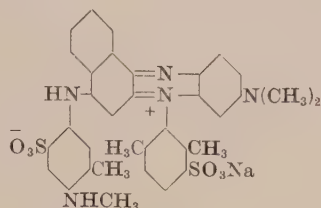
Soluble in water (blue)

H₂SO₄ conc. — dull blue green; on dilution — cornflower blue and ppt.

(b) Benzophenylsafranines

50300

Acid Dye



Condense *N*-2,6-xylyl-2-naphthylamine with *N,N*-dimethyl-*p*-nitrosoaniline hydrochloride, and condense the product with *N*²-methyltoluene-2,5-diamine (with addition of *N*-methyl-4-nitroso-*o*-toluidine as oxidising agent). Disulfonate with oleum and convert to the sodium salt

Discoverer — Huber 1935

Wool Fast Blue EB (By)

Bayer Co., BP 457448; USP 2178793; FP 804328; GP 738049
FIAT 1313, 2, 381

Soluble in water and ethanol (blue)

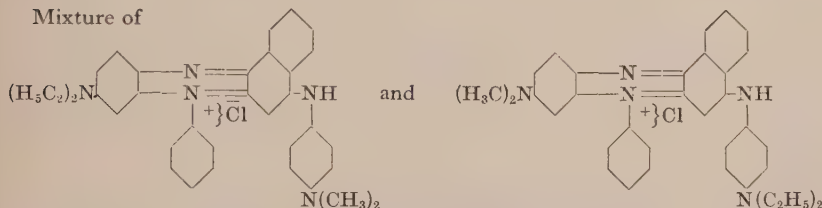
H₂SO₄ conc. — green; on dilution — cornflower blue

Aqueous solution + NaOH — bordeaux;
+ HCl — violet

50305

C.I. Basic Blue 14 (Reddish navy)

Mixture of



React *N,N*-dimethyl-*p*-nitrosoaniline hydrochloride with *N*-phenyl-2-naphthylamine and condense the product with *N,N*-diethyl-*p*-phenylenediamine

Discoverer — Schultz 1893

Agfa, GP ap. A3123 (Fr. 3, 327), 3304 (Fr. 4, 948).
cf. Witt, GP 19224 (Fr. 1, 277), 97118, 102458,
103687, (Fr. 5, 355, 361, 363)
Kehrmann, GP 183117 (Fr. 8, 523)
FIAT 764 — Diphenblau R

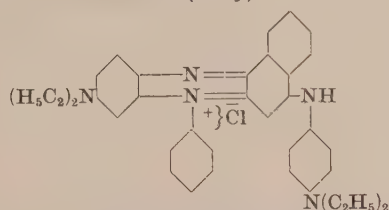
Soluble in water (violet) and ethanol (reddish violet)

H₂SO₄ conc. — green; on dilution — reddish violet ppt.

Aqueous solution + NaOH — brown ppt.

50306

C.I. Basic Blue 13 (Navy)



React *N,N*-diethyl-*p*-nitrosoaniline hydrochloride with *N*-phenyl-2-naphthylamine and condense the product with *N,N*-diethyl-*p*-phenylenediamine

Discoverer — Heimann 1899

FIAT 764 — Diphenblau B

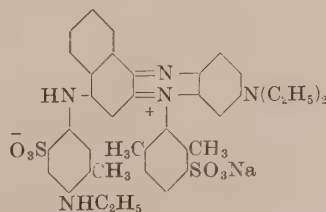
Soluble in water (violet) and ethanol (reddish violet)

H₂SO₄ conc. — green; on dilution — violet

Aqueous solution + NaOH — currant with ppt.

50310

C.I. Acid Blue 121 (Blue)



React *N*-2,6-xylyl-2-naphthylamine with *N,N*-diethyl-*p*-nitrosoaniline hydrochloride, condense the product with *N*²-ethyltoluene-2,5-diamine (with addition of *N,N*-diethyl-4-nitroso-*o*-toluidine as oxidising agent), disulfonate with 32% oleum, and convert to the sodium salt

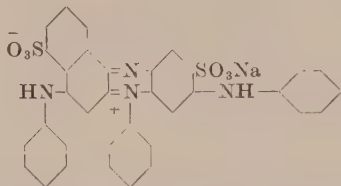
Discoverer — Huber 1935

Bayer Co., BP 457448; USP 2178793; FP 804328; GP 738049
BIOS 1433, 128. FIAT 1313, 2, 382
FIAT 764 — Supraminblau EG

Very soluble in water (blue violet) and ethanol (blue)

H₂SO₄ conc. — green; on dilution — violet

Aqueous solution + NaOH — wine red with ppt;
+ HCl — wine red

50315 C.I. Acid Blue 59 (Reddish blue)

Condense 6,8-dianilino-1-naphthalenesulfonic acid (Diphenyl Epsilon acid) with 5-amino-2-anilino benzenesulfonic acid, and oxidise the product with air with ammoniacal cuprous oxide as catalyst

Discoverer — Ott 1907

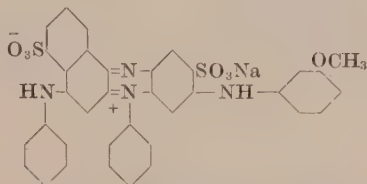
Bayer Co., BP 18729/08; USP 940354; FP 394357; GP 206646

(Fr. 9, 266)

FIAT 1313, 2, 379-380

FIAT 764 — Wollechtsblau BL

Very soluble in water (blue), ethanol (violet), and Cellosolve Insoluble in benzene, toluene, and Stoddard solvent
H₂SO₄ conc. — green (blue rim); on dilution — reddish blue
HNO₃ conc. — deep purple
Aqueous solution + NaOH — red brown with ppt;
HCl — cornflower blue with ppt.

50320 C.I. Acid Blue 102 (Blue)

Add a solution of copper sulfate in 25% ammonia to a weakly alkaline solution of 6,8-dianilino-1-naphthalenesulfonic acid (Diphenyl Epsilon acid) and 5-amino-2-(*m*-methoxyanilino)benzenesulfonic acid. Blow air through for 6 hours at 30-35°C and salt out

Discoverer — Ott 1907

Bayer Co., BP 18729/08; USP 940354; FP 394357; GP 206646

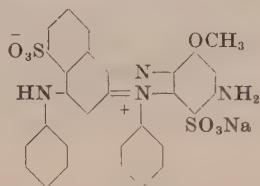
(Fr. 9, 266)

FIAT 1313, 2, 381

FIAT 764 — Wollechtsblau GL

Vlies, JSDC, 29 (1913), 321

Soluble in water (blue violet)
Soluble in ethanol (cornflower blue)
H₂SO₄ conc. — green; on dilution — reddish blue
Aqueous solution + NaOH — red brown with ppt.

50325 C.I. Acid Violet 50 (Bluish violet)

Condense 6,8-dianilino-1-naphthalenesulfonic acid (Diphenyl Epsilon acid) with 2,5-diamino-4-methoxybenzenesulfonic acid, and oxidise the product by air with ammoniacal cuprous oxide as catalyst

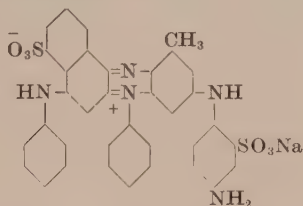
Discoverer — Ott 1907

Bayer Co., BP 18729/08; USP 940354; FP 394357; GP 206646

(Fr. 9, 266)

FIAT 764 — Wollechtsviolett B

Soluble in water and ethanol (red violet)
H₂SO₄ conc. — green; on dilution — red violet
Aqueous solution + NaOH — currant with ppt.

50330 C.I. Acid Blue 61 (Blue)

Condense 6,8-dianilino-1-naphthalenesulfonic acid (Diphenyl Epsilon acid) with 5-amino-2-(4-amino-*m*-toluidino)benzenesulfonic acid, and oxidise the product with air with ammoniacal cuprous oxide as catalyst

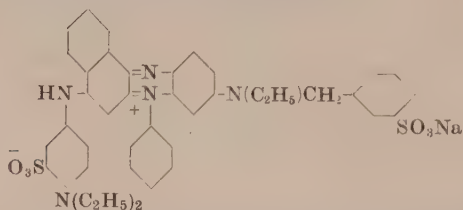
Discoverers — Nocken and Neelmeier

Bayer Co., BP 414138; USP 2001975; FP 750016; GP 611966

(Fr. 21, 823)

FIAT 764 — Wollechtsblau FFG

Very soluble in water (cornflower blue) and ethanol (pure blue)
H₂SO₄ conc. — green; on dilution — red violet
Aqueous solution + NaOH — currant with ppt.

50335 C.I. Acid Blue 98 (Reddish navy)

Condense *N*-ethyl-*N*-(*p*-nitrosophenyl)benzylamine with *N*-phenyl-2-naphthylamine, oxidise the product then condense with a mixture of *N,N*-diethyl-*p*-phenylenediamine and *N,N*-diethyl-*p*-nitrosoaniline, disulfonate with 65% oleum and convert to the sodium salt

Discoverer — Agfa 1902

FIAT 1313, 2, 382-384

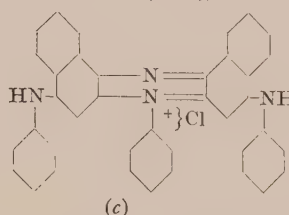
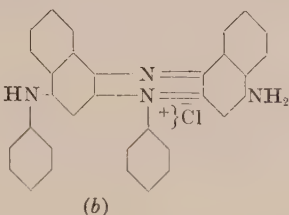
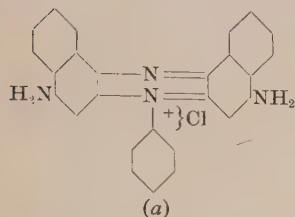
FIAT 764 — Indocyanin B

Soluble in water (navy) and ethanol (blue)
H₂SO₄ conc. — green; on dilution — violet
Aqueous solution + NaOH — bordeaux with ppt.

(c) Dibenzophenylsafranines

50370 Acid Dye

Sulfonated



Heat 4-phenylazo-1-naphthylamine, 1-naphthylamine hydrochloride, and aniline, or self-condense 2 moles of *N*-phenyl-4-phenylazo-1-naphthylamine in phenol at 120–150°C and sulfonate the products according to conditions; mono-[Naphthyl Red (a)], di-[Naphthyl Violet (b)], and tri-[Naphthyl Blue (c)] phenylated products are formed

Discoverers — Hepp and Muchall 1890

Naphthyl Red, Naphthyl Violet, Naphthyl Blue

Kalle Co., *GP* 62179, 63181, (*Fr.* 3, 349, 350)

O. Fischer & Hepp, *Ann.* 262 (1891), 238; 272 (1893), 306, 338

JSDC, 8 (1892), 90

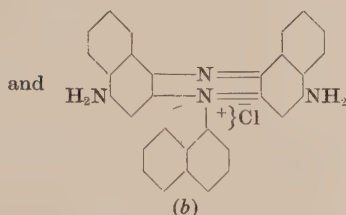
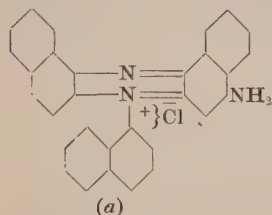
Soluble in water [(b) reddish violet; (c) blue]

Soluble in ethanol [(b) reddish violet]

H₂SO₄ conc. — (b) green; (c) bluish green; on dilution — (b) reddish violet ppt; (c) blue

Aqueous solution + HCl — (b) reddish violet ppt; (c) blue ppt.

50375 C.I. Basic Red 6



Heat 4-(1-naphthylazo)-1-naphthylamine hydrochloride (or acetate) with 1-naphthylamine. The main product is Rhodindine (a) with 6–8% of Magdala Red (b); isolate (b) by repeated extraction with boiling water. The yield of (b) is increased appreciably by addition of 1,4-naphthalenediamine to the melt (*GP* 40868)

Discoverer — Schiendl 1868

Clavel, *BP* 225/68, 2296/68; *FP* 79738

Witt, *GP* 40868 (*Fr.* 1, 276)

Schiendl, *Bull. Soc. ind. Mulhouse*, 39 (1869), 141

A. W. Hofmann, *Ber.* 2 (1869), 374, 412

Julius, *Ber.* 19 (1886), 1365

O. Fischer & Hepp, *Ber.* 26 (1893), 2235; *Ann.* 286 (1895), 235

Mühlhäuser, *Chem. Ztg.*, 17 (1893), 497

Slightly soluble in water (red) and soluble in ethanol (red with an orange fluorescence)

H₂SO₄ conc. — greyish violet; on dilution — violet red ppt.

Aqueous solution + NaOH — reddish violet ppt.

(5) — INDULINES and NIGROSINES

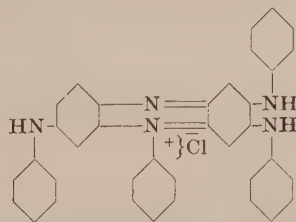
50400 C.I. Solvent Blue 7 (Reddish blue → Reddish navy)

Classical name **Induline Spirit Soluble**

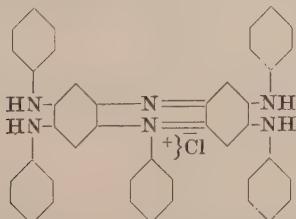
Mixtures of aminodianilino-, trianilino-, and tetraanilino-phenylphenazinium chloride

Examples — **Indamine Blue (C.I.50204)** with

Induline 3B Base (Fast Blue Base RF)



and **Induline 6B Base** or higher anilino compounds



Heat *p*-phenylazoaniline with aniline and aniline hydrochloride at 150–160°C for short periods; Indamine Blue (C.I.50204) predominates, and at higher temperature the more complex compounds are formed

Discoverers — Caro 1863; Coupier 1867

Dale & Caro, *BP* 3307/63

Thomas & Witt, *BP* 1487/81; *FP* 142468; *GP* 17340 (*Fr.* 1, 291)

M.L.B., *BP* 16325/88; *USP* 418916; *FP* 197490; *GP* 50534,

50819, 54657, (*Fr.* 2, 195, 197, 200; 3, 313)

BIOS 1433, 82, 93, 104

FIAT 764 — Indulinbase NF, RM, 5BM

Witt, *Ber.* 17 (1884), 74; 20 (1887), 1538

O. Fischer & Hepp, *Ber.* 20 (1887), 2479; 23 (1890), 838; 25

(1892), 2731; 28 (1895), 2283; 29 (1896), 361; 33 (1900), 1498;

Ann. 256 (1890), 233; 262 (1891), 237; 266 (1892), 256;

272 (1893), 306; 286 (1895), 187

JSDC, 10 (1894), 187

Kehrmann & Klopfenstein, *Ber.* 56 (1923), 2394

Kehrmann & Stanoyévitch, *Helv. Chim. Acta*, 8 (1925), 661

Lal & Kapur, *Brit. Chem. Abs.* (1945), B II, 172

Insoluble in water

Soluble in ethanol (blue violet to blue)

Soluble in chloroform, benzene, toluene, carbon tetrachloride, ethyl acetate, linseed oil, oleic acids, paraffin wax, and stearic acid

H₂SO₄ conc. — blue; on dilution — violet blue ppt.

50405 C.I. Acid Blue 20 (Navy)

Sulfonate the various brands of Induline Spirit Soluble (**C.I.50400**) and convert the products into the sodium salts

Discoverer — Coupier 1867

Coupier, *BP* 3657/67; *FP* 77854

FIAT 764 — Indulingruen, Indulin B, 6B, R

Wolff, *Chem. News*, **39** (1879), 270; **40** (1880), 3

Witt, *Färberztg.* **2** (1890), No. 1; cf. *JSDC*, **6** (1890), 42

Soluble in water (bluish violet to blue) and ethanol (blue)
 H_2SO_4 conc. — blue; on dilution — blue to violet with blue ppt.
Aqueous solution + NaOH — reddish violet ppt.

50410 Basic Dye

Heat Induline Spirit Soluble (**C.I.50400**) with *p*-phenylenediamine

Discoverer — Istel 1890

Para Blue (NI)

Dyes tannin-mordanted cotton greyish blue

Gr.El., *GP* 57559

M.L.B., *FP* 194032; *GP* 50819 (*Fr.* **2**, 197)

FIAT 764 — Parablau spritl. Parablau sehr gruen

Soluble in water and ethanol (blue)

H_2SO_4 conc. — blue; on dilution — light blue ppt.

Aqueous solution + NaOH — brownish violet ppt.

50411 Basic Dye

Heat *p*-phenylenediamine with *p*-phenylazoaniline hydrochloride in presence of benzoic acid

Discoverer — Elsässer 1886

Paraphenylene Blue R (WDC), Indophenine (By)

Dyes tannin-mordanted cotton blue becoming darker and faster to light and washing on being chromed

Dahl Co., *BP* 10134/86; *FP* 191151; *GP* 36899, 39763, (*Fr.* **1**, 294, 296), 43088, 44406, 45803, (*Fr.* **2**, 195, 191, 209)

Bayer Co., *GP* 53198 (*Fr.* **2**, 192)

Knecht, *JSDC*, **4** (1888), 96; *Chem. Ztg.* **12** (1888), 1748; cf. *JSCI*, **8** (1888), 189

O. Fischer & Hepp, *Ber.* **23** (1890), 838

Soluble in water and ethanol (violet blue)

H_2SO_4 conc. — blue; on dilution — unaltered

Aqueous solution + NaOH — violet ppt.

50415 C.I. Solvent Black 5 (Bluish black)*

50415:1 (**C.I. Solvent Black 7**) is the free base

Discoverer — Coupier 1867

Coupier, *BP* 3657/67; *FP* 77854

BIOS 959, 10. *BIOS* 1433, 82, 93, 104

FIAT 764 — Nigrosin NBV, T, TA, Base

Wolff, *Chem. News*, **39** (1879), 270; **40** (1880), 3

Fluorindines

O. Fischer & Hepp, *Ber.* **23** (1890), 2789; **28** (1895), 293; **29** (1896), 361, 367

Kehrmann, *Ber.* **27** (1894), 3348; **28** (1895), 1543

Kehrmann & Guggenheim, *Ber.* **34** (1901), 1217

Nietzki & Slaboszewicz, *Ber.* **34** (1901), 3727

Wilberg, *Ber.* **35** (1902), 958

Nietzki & Vollenbruck, *Ber.* **37** (1904), 3887

Standard

Poland PN C 04720:1963 (Nigrosines. Methods of testing)

Insoluble in water

Soluble in ethanol (bluish black), benzene, and toluene

Very soluble in oleic and stearic acids

Classical name **Nigrosine Spirit Soluble**

Various compounds formed by

(a) Heating nitrobenzene, aniline, and aniline hydrochloride with iron or copper at 180–200°C

(b) Heating nitrophenol or the nitro-cresols, aniline, and aniline hydrochloride with a little iron at 180–200°C

* (Spirit varnish)

H_2SO_4 conc. — blue to blue black; on dilution — blue black ppt.

HNO_3 conc. — blue to blue black

50420 C.I. Acid Black 2 (Black)

Sulfonate various brands of Nigrosine Spirit Soluble (**C.I.50415**) and convert the products into the respective sodium salts

Discoverer — Coupier 1867

Coupier, *BP* 3657/67; *FP* 77854

FIAT 764 — Nigrosin GF wasserl. Indulin WL (*FDX* 885)

Wolff, *Chem. News*, **39** (1879), 270; **40** (1880), 3

Lal & Kapur, *Brit. Chem. Abs.* (1945), B II, 172

Standard

Poland PN C 04720:1963 (Nigrosines. Methods of testing)

Soluble in water (bluish violet)

Soluble in ethanol (blue)

H_2SO_4 conc. — blue; on dilution — violet and ppt.

Aqueous solution + NaOH — brownish violet ppt.

50425★ Basic Dye

Mixtures of azine dyes under the names **Rubramine, Indamine 3R, Indamine 6R**

React *N,N*-dimethyl-*p*-nitrosoaniline hydrochloride with *o*(and *p*)-toluidine and their hydrochlorides

Discoverer — Istel 1889

Rubramine (NI), Indamine 3R, 6R (NI)

Dye tannin-mordanted cotton bluish to reddish violets

Noetzel Co., *BP* 17204/89; *FP* 214373; *GP* 55532, 58345, (*Fr.* **2**, 162, 162)

Soluble in water (magenta red)

H_2SO_4 conc. — green; on dilution — blue then red

Aqueous solution + NaOH — violet ppt.

50430 Acid Dye

Mixtures of Azine dyes

React aniline (or *p*-toluidine) with the condensation product of *N,N*-dimethyl-*p*-nitrosoaniline hydrochloride and 2-naphthol-6-sulfonic acid

Discoverer — M.L.B. 1890

Wool Grey B, G, R (MLB)

M.L.B., *BP* 4577/90; *FP* 204545; *GP* 56992 (*Fr.* **3**, 377)

Soluble in water and ethanol

H_2SO_4 conc. — blue to yellowish brown, according to brand; on dilution — precipitates

Aqueous solution + NaOH — brown

50431 C.I. Basic Black 1 (Grey)**Mixtures of Azine Dyes**

(a) Boil an aqueous or ethanolic solution of *N,N*-dimethyl-*p*-nitrosoaniline hydrochloride

(b) React *N,N*-dimethyl-*p*-nitrosoaniline hydrochloride with Gambier Cutch, C.I. Natural Brown 3, in aqueous acetic acid solution at ordinary temperature

(c) Oxidise *N,N*-dimethyl-*p*-phenylenediamine (GP 61504)

Discoverers — Ullrich 1885; Löw and Duisberg 1888; Ehrmann 1888; Hirsch 1890; Pokorny 1890

S.A. St. Denis, *BP* 5032/89, 16448/89; *USP* 420311; *FP* 195605; *GP* 49446 (*Fr.* 2, 186), 61504 (*Fr.* 3, 400)

Baumann, *Bull. Soc. ind. Mulhouse*, **60** (1890), 65; cf. *JSDC*, **6** (1890), 96

Soluble in water (reddish grey) and ethanol (reddish grey)

H₂SO₄ conc. — greenish; on dilution — reddish grey

Aqueous solution + NaOH — greyish black ppt. soluble in benzene or ether (cherry red)

50435 Basic Dye

Heat toluene-2,5-diamine with *p*-phenylazoaniline hydrochloride in presence of benzoic acid

Discoverers — Egli and Warth 1889

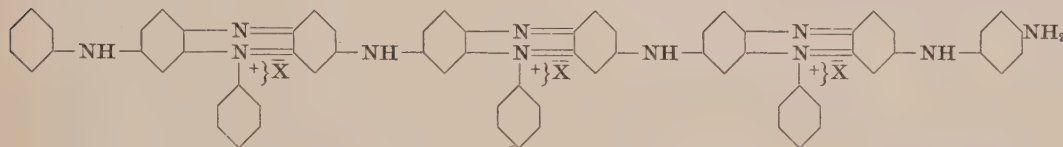
Toluylene Blue (GrE) (cf. C.I.49410)

Griesheim-Elektron, *GP* 53357, 54679, (*Fr.* 2, 201, 202)

Solubilities and reactions similar to those of **C.I.50400**

**50440 C.I. Oxidation Base 1 (Black)
C.I. Pigment Black 1 (Black)**

Classical name **Aniline Black**



Ungreenable Aniline Black

(X = Acid radical, probably chromate in *aged* or *chromed* blacks)

Oxidise aniline either on the fibre or in substance in the presence of a catalyst such as a copper or vanadium salt. The presence of excess aniline is essential for the development of the ungreenable black shown above

Discoverer — Lightfoot 1863

Willstätter, *Chem. Ztg.* **30** (1906), 955

Willstätter & Moore, *Ber.* **40** (1907), 2665

Green, *JSDC*, **25** (1909), 188

Willstätter & Dorogi, *Ber.* **42** (1909), 2147, 4118

Willstätter & Crämer, *Ber.* **43** (1910), 2588, 2976

Green & Woodhead, *JCS*, **97** (1910), 2388; *Ber.* **45** (1912), 1955

Green & Wolff, *Ber.* **44** (1911), 2570; *Ber.* **46** (1913), 33

Green & Johnson, *JSDC*, **29** (1913), 338

Erban, *Chem. Ztg.* **37** (1913), 1161

Saunders, Technical Work of A. G. Green, *JSDC*, **60** (1944), 85
See also C.I.76000-1

NOTES

NOTES

OXAZINE COLOURING MATTERS

The chromophore of this class is the oxazine ring, $\begin{array}{c} \diagup \text{C} - \text{N} = \text{C} \diagdown \\ || \quad | \\ \text{C} - \text{O} = \text{C} \\ | \\ + \end{array}$, which forms the centre of three condensed rings of which the outer pair may be benzene or naphthalene. Substitution of auxochromes in *meta*-position to the oxygen gives dyes which are then resonance hybrids of *ortho*- and *para*-quinonoid reference structures.

The dyes are classified as—(a) Mono-oxazines, in which one auxochrome at least is a free or substituted amino group; (b) Dioxazines, where two oxazines are condensed together; and (c) Oxazones, in which the auxochromes are hydroxyl groups.

The oxazines are basic dyes for wool, which are applied to cotton on a tannin mordant; also they have uses for leather and as solvent dyes. Compounds of the galloxyaniline group, which contain pyrogallol or gallic acid as components, are generally used in leuco or quinhydrone form, and possess valuable mordant-dyeing properties especially on chromium mordants.

Some brilliant blue direct dyes of great fastness to light for cotton and wool are sulfonated dioxazine compounds, made by condensation of chloranil with amines followed by ring closure and sulfonation.

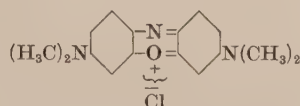
Literature

As for the Azine class, p. 3409

(a) MONO-OXAZINES

51000 Basic Dye

Zinc double chloride of



React an excess of *N,N*-dimethyl-*p*-nitrosoaniline hydrochloride with *m*-dimethylaminophenol

Discoverer — Bender 1890

Capri Blue GN (L)

Dyes tannin-mordanted cotton greenish blue. It is exceptionally fast to light when dyed on acetate rayon

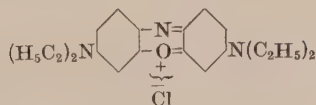
Patents and Literature as in **C.I.51015**

Soluble in water (blue)

H₂SO₄ conc. — reddish brown; on dilution — paler but no colour change

Aqueous solution + HCl — reddish brown

51004 C.I. Basic Blue 3 (Bright greenish blue)



Nitrosate *N,N*-diethyl-*m*-anisidine or *N,N*-diethyl-*m*-phenetidine and condense the hydrochloride with *m*-diethylaminophenol

Discoverers — I.G. and I.C.I.

BIOS 1433, 5, 8. *FDX* 885

FIAT 764 — Rhodulinreinblau 3G, Zaponechtblau 3G

Bayer & Co., *GP* 300253 (*Fr.* 13, 360)

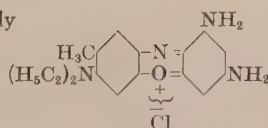
Moores, Balon, & Maynard, *J. Heterocycl. Chem.*, **6** (1969), 755

Psaar & Heitzer, *Ber.* **102** (1969), 3603

Note — **Zapon Fast Blue 3G (IG)** was chemically identical with Rhoduline Sky Blue 3G, but its manufacture differed in the finishing procedure, the dye being washed ice-cold with 94% ethanol to keep it free from salt

51010 Basic Dye

Possibly



React 5-diethylamino-2-nitroso-*p*-cresol hydrochloride with *m*-phenylenediamine

In general react a 5-dialkylamino-2-nitroso-*p*-cresol hydrochloride with *m*(or *p*)-phenylenediamines or their *N,N*-dialkyl derivatives

Discoverer — Bender 1892

Cresyl Blue BBS, 2RN (L)

Used in calico printing for tannin-discharge effect as it yields a pure white. Dyes tannin-mordanted cotton blue

Leonhardt Co., *BP* 1390/92, 21154/92; *FP* 224047 and addns.;

GP 74918, 75234, 75243, (*Fr.* 3, 390, 392, 392)

FDX 885 — Cresyl Blau RRN and Brillant Cresyl Blau BB

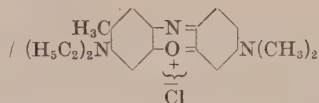
Soluble in water (blue)

H₂SO₄ conc. — dichroic (green by reflected and violet red by transmitted light); on dilution — brown

Aqueous solution + NaOH — brown ppt.

51015 Basic Dye

Zinc double chloride of

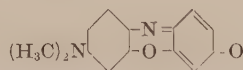


React an excess of *N,N*-dimethyl-*p*-nitrosoaniline hydrochloride with 3-diethylamino-*p*-cresol

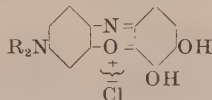
H₂SO₄ conc. — green when in thin layers, red in thick layers;
on dilution — red
Aqueous solution + HCl — red

51020 Basic Dye

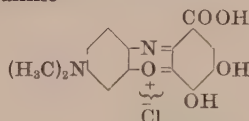
Tannin lake of



React *N,N*-dimethyl-*p*-nitrosoaniline hydrochloride with resorcinol in presence of tannin on the fibre

51025 C.I. Mordant Violet 35 (Reddish violet)

Decarboxylate the galloxyaniline or leucogalloxyaniline (obtained from an *N,N*-dialkyl-*p*-nitrosoaniline hydrochloride and gallic acid) at about 100°C

51030 C.I. Mordant Blue 10 (Reddish navy)Classical name **Galloxyaniline**

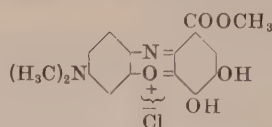
Heat an excess of *N,N*-dimethyl-*p*-nitrosoaniline hydrochloride with gallic acid in methanol (ethanol is unsatisfactory)
Render soluble as bisulfite compound

H₂SO₄ conc. — cornflower blue; on dilution — magenta red
Aqueous solution + NaOH — reddish violet

51035 Mordant Dye

Prepare by reacting a leucogalloxyaniline with a galloxyaniline, whereby a compound of a quinhydrone type is obtained characterised by greater solubility

H₂SO₄ conc. — blue; on dilution — red
Aqueous solution + NaOH — reddish violet

51040 C.I. Mordant Violet 54 (Dull bluish violet)

React an excess of *N,N*-dimethyl-*p*-nitrosoaniline hydrochloride with methyl gallate

Discoverer — Bender 1890

Capri Blue GON (L)

Dyes tannin-mordanted cotton greenish blue

Leonhardt Co., *BP* 13565/90, 18623/90; *USP* 494838; *FP* 211035;
GP 62367, 63238, 68557, 68558, 69820, 71250, (*Fr.* 3, 382, 383, 384, 384, 386, 386)

Chem. Ind. **14** (1891), 398; **15** (1892), 130*Monit. sci.* **6** [4] (1892), 436Möhlau, Klimmer, & Kahl, *Z. Farb. u. Textilchem.* **1** (1902), 313Thorpe, *JCS*, **91** (1907), 325Briggs, *JSDC*, **37** (1921), 291Michaelis & Granick, *JACS*, **67** (1945), 1212

Soluble in water and ethanol (blue)

Discoverer — Ullrich 1898

Resorcine Blue (MLB)

Dyes cotton padded with a mixture of resorcinol, *N,N*-dimethyl-*p*-nitrosoaniline and tannin, steamed and treated with tartar emetic, indigo blue of moderate fastness to light and washing

M.L.B., *BP* 6056/98; *USP* 649227, 649228; *FP* 276555 and addn.;
GP 103921, 108779, (*Fr.* 5, 332, 334)

Fussgänger, *Dissertation*, Basle, 1901Richard, *Bull. Soc. ind. Mulhouse*, **91** (1925), 43

On the Fibre

H₂SO₄ conc. — fibre darkens and solution is blue; on dilution — unaltered

Fibre + NaOH — brown

Discoverer — de la Harpe 1907

Durand & Huguenin, *BP* 1334/07, 9961/07; *USP* 863907;
FP 377024; *GP* 201149, 205215, (*Fr.* 9, 243, 244)

cf. Bayer Co., *GP* 192971 (*Fr.* 9, 249)

Soluble in water (blue)

H₂SO₄ conc. — pale brownish violet (blue with addition of MnO₂); on dilution — reddish

Aqueous solution + NaOH — oxidation to a dark violet red

Discoverer — Koechlin 1881

Koechlin, *BP* 4899/81; *USP* 253721, 257498; *FP* 145685;
GP 19580 (*Fr.* 1, 269)

Bayer Co., *BP* 12207/09; *FP* 405537; *GP* 217397 (*Fr.* 10, 270)Ciba, *BP* 15751/15; *USP* 1227407*BIOS* 1433, 133-134*FIAT* 764 — GalloxyaninKoechlin, *Monit. sci.* **13** [3] (1883), 292; *Bull. Soc. ind.**Mulhouse*, **53** (1883), 206Nietzki & Otto, *Ber.* **21** (1888), 1740Nietzki & Bossi, *Ber.* **25** (1892), 2994Vaucher, *Z. Farb.-Ind.* **1** (1902), 244Kehrmann & Beyer, *Ber.* **45** (1912), 3338Knecht & Hibbert, *JSDC*, **31** (1915), 242Richard, *Bull. Soc. ind. Mulhouse*, **91** (1925), 43

Insoluble in water

Slightly soluble in alcohol (bluish violet)

Discoverer — Steiner 1907

Sandoz, *BP* 21109/07; *USP* 901657; *FP* 382335; *GP ap.*
C16071 (*Fr.* 9, 254)

Soluble in water (violet blue) and ethanol (blue)

Discoverer — Kern 1886

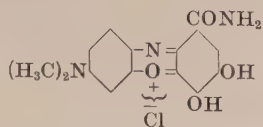
Kern, *BP* 5953/87; *USP* 396574; *GP* 45786 (*Fr.* 2, 167)

FDX 885 — Galloblau ENietzki & Otto, *Ber.* **21** (1888), 1742Nietzki & Bossi, *Ber.* **25** (1892), 2994Möhlau & Klimmer, *Z. Farb.-Ind.* **1** (1902), 68; **4** (1905), 89Gnehm & Bauer, *J. prakt. Chem.* **72** (1904), 260Grandmougin & Bodmer, *J. prakt. Chem.* **77** (1908), 500Kehrmann & Beyer, *Ber.* **45** (1912), 3338Knecht & Hibbert, *JSDC*, **31** (1915), 242Richard, *Bull. Soc. ind. Mulhouse*, **91** (1925), 43

Soluble in water (reddish violet) and ethanol (bluish violet)

H₂SO₄ conc. — cornflower blue; on dilution — magenta red

Aqueous solution + NaOH — brown ppt. soluble in excess (violet)

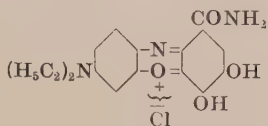
51045 C.I. Mordant Blue 45 (*Reddish blue* → *Navy*)Classical name **Gallamine Blue**

React an excess of *N,N*-dimethyl-*p*-nitrosoaniline hydrochloride with gallamide; render soluble as **bisulfite compound**

Discoverer — Geigy 1889Geigy, *BP* 2941/89; *USP* 410733; *FP* 196146; *GP* 48996 (*Fr.* 2, 169)Ciba, *BP* 15751/15; *USP* 1227407*BIOS* 1433, 136*FIAT* 764 — GallaminblauKnecht, *JSDC*, 5 (1889), 170Gnehm & Bauer, *J. prakt. Chem.* 72 (1904), 254

Soluble in water (greenish)

H₂SO₄ conc. — red (green in thin layers); on dilution — wine red
NaOH conc. — reddish violet; on dilution — red flocculent ppt.

51050 C.I. Mordant Blue 14 (*Reddish navy*)

React an excess of *N,N*-diethyl-*p*-nitrosoaniline hydrochloride, or of *N,N*-diethyl-*p*-phenylazoaniline, with gallamide

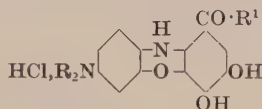
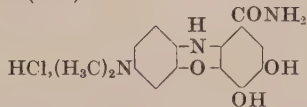
Discoverer — Bierer 1893Durand & Huguenin, *BP* 14137/93, 10333/94; *USP* 534809; *FP* 227509; *GP* 76937, 80434, (*Fr.* 4, 485, 489)Ciba, *BP* 15751/15; *USP* 1227407*BIOS* 1433, 134*FIAT* 764 — Coelestinblau B*JSDC*, 9 (1893), 160Gnehm & Bauer, *J. prakt. Chem.* 72 (1905), 249Grandmougin & Bodmer, *J. prakt. Chem.* 77 (1908), 502

Soluble in water (reddish violet) and alcohol (blue)

H₂SO₄ conc. — cornflower blue; on dilution — magenta red
Aqueous solution + NaOH — bluish violet and violet ppt.

51055 C.I. Mordant Violet 50 (*Bright reddish violet*)**C.I. Mordant Blue 36** (*Reddish blue*)Hydrochlorides of various **leucogallocyanines**

General formula —

R = CH₃ or C₂H₅R¹ = NH₂ or OCH₃e.g. **Modern Violet (DH)** —

Reduce the relevant gallocyanine with sodium sulfide and hydrochloric acid (not with sodium sulfite, bisulfite, or sulfurous acid)

Note — Modern Violet must be manipulated in the cold owing to ease of oxidation and risk of spontaneous combustion, due apparently to the presence of finely divided sulfur (Fierz-David & Blangey)

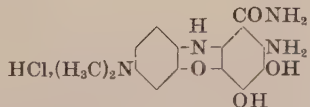
Discoverers — de la Harpe and Vaucher 1898Durand & Huguenin, *BP* 21415/98; *USP* 629666 *FP* 280176; *GP* 108550 (*Fr.* 5, 338)Geigy, *GP* 233179 (*Fr.* 10, 267)Ciba, *BP* 15751/15; *USP* 1227407Vaucher, *Bull. Soc. ind. Mulhouse*, 71 (1901), 403Briggs, *JSDC*, 37 (1921), 290Fierz-David & Blangey, *Farbenchemie* (1952), 303

Soluble in water (pale greenish blue)

H₂SO₄ conc. — pale and dichroic solution converted to blue by oxidising agents

HCl conc. — violet

Aqueous solution + NaOH — rapid oxidation (bluish violet)

51060 Mordant Dye*Leuco*-compound

Heat Gallamine Blue (**C.I.51045**) with ethanolic-ammonia in presence of an aromatic nitro-hydrocarbon, such as *m*-dinitrobenzene at 110–130°C in an autoclave, and reduce

Discoverers — de la Harpe and Burckhardt 1908**Aminogallamine Blue (DH)**

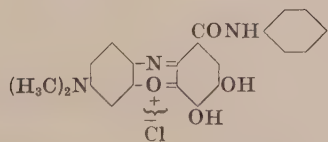
Dyes chromed wool and cotton blue

Durand & Huguenin, *BP* 12067/08; *USP* 898842; *FP* 391888; *GP* 199846 (*Fr.* 9, 238)

Soluble in water (brownish red)

H₂SO₄ conc. — brownish red; on dilution — unaltered

Aqueous solution + NaOH — oxidation to a greyish blue ppt.

51065 Mordant Dye

React an excess of *N,N*-dimethyl(or diethyl)-*p*-nitrosoaniline hydrochloride with gallanilide

Note — Bisulfite compound — **Gallanil Violet BS (DH)***Discoverers* — Mohler and Mayer 1889**Gallanil Violet B, BS, R (DH)**

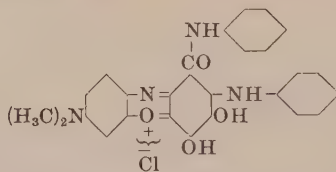
Dyes chromed wool and silk violet, also dyes wool blue from an acid bath

Ciba, *BP* 11848/89; *USP* 420164; *FP* 199850; *GP* 50998 (*Fr.* 2, 169)Durand & Huguenin, *BP* 15360/89Nietzki & Bossi, *Ber.* 25 (1892), 2995

Slightly soluble in water and ethanol (blue)

H₂SO₄ conc. — greyish red; on dilution — dull claret ppt.

Aqueous solution + NaOH — bright bluish violet

51070 Mordant Dye

React Gallanil Violet R (C.I.51065) with aniline

Note — The ammonium salt of the sulfonic acid is **Gallanil Indigo P (DH)**

Discoverers — Mohler and Mayer 1890

Gallanil Blue (DH), Gallanil Indigo P (DH)

Dyes chromed wool and silk indigo blue

Ciba, *BP* 11848/89; *USP* 420164; *FP* 199850; *GP* 50998 (*Fr.* 2, 169)

Durand & Huguenin, *BP* 583/91; *USP* 444538; *GP* 56991 (*Fr.* 3, 365)

Bayer Co., *BP* 4963/09; *FP* 396564 addn. of 23/2/09
FDX 885 — Gallanilblau

Properties of the sulfonate

Soluble in water (indigo blue)

H_2SO_4 conc. — brownish violet; on dilution — brown ppt.

Aqueous solution + NaOH — bluish violet

51075 Mordant Dye

Nitrate Gallanil Indigo PS (C.I.51070)

Discoverer — Brack 1895

Fast Green G (DH), Gallanil Green (DH)

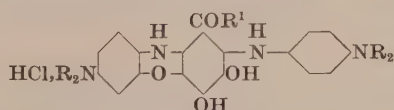
Dyes chromed wool green

Durand & Huguenin, *FP* 251086 and addn.; *GP* 86415 (*Fr.* 4, 491)

Soluble in water (bluish green)

H_2SO_4 conc. — crimson red; on dilution — blue ppt.

NaOH conc. — violet; on dilution — bluish green ppt.

51080 C.I. Mordant Blue 35 (Greenish → Reddish navy)

$\text{R} = \text{CH}_3$ or C_2H_5 ; $\text{R}^1 = \text{NH}_2$ or OCH_3

React the relevant gallocyanine with *N,N*-dimethyl(or diethyl)-*p*-phenylenediamine in presence of nitro(or *m*-dinitro)benzene and reduce to the *leuco*-compound

Discoverer — Lorétan 1906

Durand & Huguenin, *BP* 21949/06; *USP* 844155; *FP* 376794; *GP* 189940, 189941, (*Fr.* 9, 234, 235)

Ciba, *BP* 15751/15; *USP* 1227407

Grandmougin & Bodmer, *J. prakt. Chem.* 77 (1908), 508

Soluble in water (pale bluish green)

H_2SO_4 conc. — pale reddish brown (violet on addition of MnO_2); on dilution — brownish

Aqueous solution + NaOH — oxidation to violet

51085 Mordant Dye

React formaldehyde with the gallocyanine obtained from gallamide and *N,N*-diethyl-*p*-nitrosoaniline, treat the product with water or acids at 100–200°C, whereby more soluble compounds are formed (*GP* 167805), and finally reduce to the *leuco*-compounds (*GP* 171459)

Discoverers — Oswald, de la Harpe, and Lorétan 1905

Gallo Green (DH), Modern Blue (DH)

Dyes chromed cotton green to dark blue. Dyes of this group are still used in mixtures

Durand & Huguenin, *BP* 3497/05; *USP* 807181, 807182; *FP* 351658; *GP* 167805, 171459 (*Fr.* 8, 501, 504)

Fierz-David, *Künstliche Organische Farbstoffe* (1926), 362

Soluble in water (green to brownish)

H_2SO_4 conc. — pale brownish violet; on dilution — reddish

Aqueous solution + NaOH — oxidised (reddish violet)

51090 C.I. Mordant Violet 55 (Dull bluish violet)

Galloycyanine sulfonic acids

(a) React a 6-dialkylamino-3,4'-azodibenzene-sulfonic acid with gallic acid or its derivatives (*GP* 80434)

(b) Sulfonate a leucogallocyanine and oxidise (*GP* 118393)

Discoverer — Bierer 1894

Durand & Huguenin, *BP* 10333/94, 14137/94; *USP* 534809, 663220, 663221; *FP* 227509, 242956, 300114; *GP* 80434 (*Fr.* 4, 489), 118393 (*Fr.* 6, 495)

Soluble in water (blue)

H_2SO_4 conc. — bluish violet; on dilution — reddish violet to wine red

Aqueous solution + NaOH — violet

51095 Mordant Dye

Sulfonic acids of leucogallocyanines

Prepare by reacting sodium sulfite, bisulfite, or sulfur dioxide with gallocyanines, such as Gallamine Blue (C.I.51045) at 100°C in an autoclave

Note — A mixture of three different products is obtained, the proportions varying with the conditions (*GP* 104625)

Discoverers — de la Harpe and Vaucher 1898

Brilliant Gallocyanine (DH)

Dyes chromed wool and cotton bright blue of good fastness

Durand & Huguenin, *BP* 6055/98; *USP* 613578, 638576; *FP* 275798; *GP* 104625, 105736, (*Fr.* 5, 335, 337)

Scheurer, *Rev. gén. Mat. col.* 3 (1895), Nos. 5, 7

Vaucher, *Bull. Soc. ind. Mulhouse*, 71 (1901), 403

Soluble in water (violet)

H_2SO_4 conc. — dark violet or pale brownish red dichroic solution (converted into blue by oxidising agents); on dilution — reddish violet

Aqueous solution + NaOH — redder converted to blue on exposure to air

51100 Mordant Dye

Prepare by action of sulfites on sulfonated gallocyanines

Discoverers — de la Harpe, Vaucher, and Lorétan 1898

Indalzarine J, R (DH)

Dyes chromed wool and cotton reddish blue of good fastness

Durand & Huguenin, *BP* 6055/98, 11491/00; *USP* 613578, 662224; *FP* 275798; *GP* 104625, 105736, (*Fr.* 5, 335, 337), 118394 (*Fr.* 6, 497)

Soluble in water (olive)

H_2SO_4 conc. — pale bordeaux red to violet dichroic solution

Aqueous solution + NaOH — brown, oxidised by air to bluish violet

51105 Mordant Dye

Reduce monoarylated gallocyanines to soluble *leuco*-compounds by heating with sodium hydrosulfite in aqueous ethanol (which will not remove the arylamino group during heating)

The reaction is continued until the product dissolves in concentrated sulfuric acid with a brownish yellow to orange colour

Discoverer — Vaucher 1909

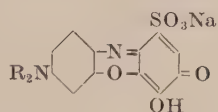
Cyanazurine (DH)

Dyes chromed cotton greenish blues

Durand & Huguenin, *BP* 16207/08; *USP* 929350; *FP* 394136; *GP* 207669 (*Fr.* 9, 241)

Soluble in water (pale yellowish green) and ethanol (pale blue)
H₂SO₄ conc. — brownish yellow; on dilution — brownish red ppt.

Aqueous solution + NaOH — oxidised (dark blue)

51110 Mordant Dye

[R = CH₃, C₂H₅, or benzyl]

React an excess of an *N,N*-dialkyl-*p*-nitrosoaniline with 3,4,5-trihydroxybenzenesulfonic acid, and convert the product to the sodium salt

Discoverers — de la Harpe, Burckhardt, and Zehntner 1908

Pyrogallolcyanine sulfonic acids (DH)

Dyes chromed wool blue to violet

Durand & Huguenin, *BP* 19002/07; *USP* 898039; *GP* 203145 (*Fr.* 9, 247)

Soluble in water (violet blue)
H₂SO₄ conc. — blue; on dilution — red to violet
Aqueous solution + HCl — red ppt.

51115 Mordant Dye**Nitrogallocyanine sulfonic acid**

React nitric acid with a sulfonated gallocyanine (an indalizarine)

Discoverers — de la Harpe and Lorétan

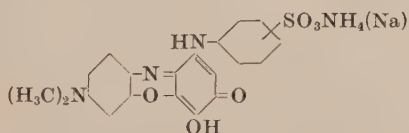
Indalizarine Green (DH)

Dyes chromed wool green

H₂SO₄ conc. — dark reddish violet

51120 C.I. Mordant Blue 56 (Greenish blue)

Classical name **Delphine Blue**



Heat aniline with the hydrochloride of Gallocyanine (**C.I.51030**) and sulfonate; convert to the sodium salt

Note — The yield is improved by blowing air into the mixture while heating to prevent the formation of leuco-Gallocyanine, which does not condense with aniline

Discoverer — Hagenbach 1889

Kern & Sandoz, *BP* 569/90; *FP* 201465; *GP* 55942 (*Fr.* 2, 172)

Ciba, *BP* 15751/15; *USP* 1227407

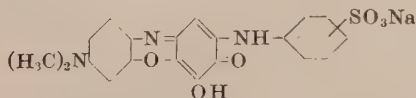
Nietzki & Otto, *Ber.* 21 (1888), 1741

Grandmougin & Bodmer, *Ber.* 41 (1908), 604

Bodmer, *Dissertation*, Zürich, 1908, p. 74

Vlies, *JSDC*, 29 (1913), 321

Soluble in water (bluish violet)
H₂SO₄ conc. — reddish violet; on dilution — dark blue ppt.
Aqueous solution + NaOH — reddish ppt.

51125 C.I. Mordant Blue 59 (Bluish green)

React aniline (*in the cold*) with the hydrochloride of Gallocyanine (**C.I.51030**) (or the corresponding diethyl compound), remove the carboxyl group at 100°C, and sulfonate; convert to the sodium salt

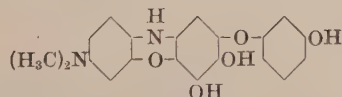
Note — The corresponding diethyl-compound is probably **Gallophenine GD (By)** (*USP* 936247)

Discoverers — de la Harpe and Bodmer 1908

Durand & Huguenin, *GP* 206465 (*Fr.* 9, 239), 229708 (*Fr.* 10, 264)

Bayer Co., *BP* 20368/08; *USP* 936247, 936248

Soluble in water (deep blue) and ethanol (violet)
H₂SO₄ conc. — wine red; on dilution — somewhat browner
Aqueous solution + NaOH — violet

51130 Mordant Dye

Condense Gallocyanine (**C.I.51030**) with resorcinol in alkaline solution; render soluble as the hydrochloride

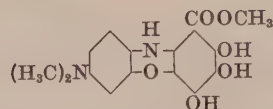
Discoverer — Steiner 1908

Ultracyanine B, R (S)

Dyes chromed wool or cotton violet

Sandoz, *BP* 6270/09, 6272/09; *USP* 992613; *FP* 399799; *GP ap.* C17165, C17286, (*Fr.* 9, 255, 255)

Soluble in water and ethanol (yellow green or pale blue according to brand)
H₂SO₄ conc. — colourless or pale blue; on dilution — colourless or faintly yellow
Aqueous solution + NaOH — colourless; rapidly oxidised to blue or violet

51135 Mordant Dye

React **C.I.51040** with aniline, hydrolyse the anilino linkage with boiling ethanolic hydrochloric acid, and reduce

Discoverers — Zehntner and Oswald 1907

Modern Azurine (DH)

Dyes chromed cotton in blue shades of good discharging properties

Durand & Huguenin, *BP* 19001/07; *FP* 380513; *GP* 198181 (*Fr.* 9, 236)

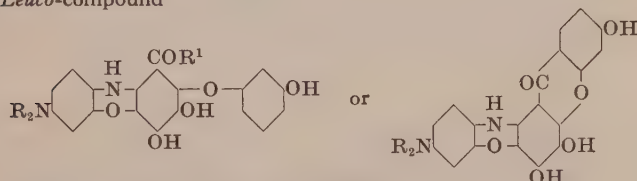
Grandmougin & Bodmer, *Ber.* 41 (1908), 604
Bodmer, *Dissertation*, Zürich, 1908

Soluble in water (yellow)

H₂SO₄ conc. — green; on dilution — yellow
Aqueous solution + NaOH — oxidised (blue)

51140 Mordant Dye

Leuco-compound



Definition of R and R¹ as in **C.I.51055**

Condense gallocyanines with resorcinol in acid solution

Note — The product of interaction appears to be dependent upon whether the carboxyl group is free (in which case it is probably replaced) or not (when condensation occurs in *o*-position to the COR' group)

Discoverer — de la Harpe 1893

Phenocyanine VS, V, R (DH)

Dyes chromed wool or cotton indigo blue

Durand & Huguenin, *BP* 24802/93, 15064/94; *USP* 531148, 992613; *FP* 231316 and addn.; *GP* 77452 (*Fr.* 4, 495)

Möhlau & Klimmer, *Z. Farb.-Ind.* 1 (1902), 62

Soluble in water

Slightly soluble in ethanol

H₂SO₄ conc. — pale brown; on dilution — oxidised slowly to blue
Aqueous solution + NaOH — brown, rapidly oxidised to blue

51145 Mordant Dye

Oxidise Phenocyanine VS (**C.I.51140**) with air

Slightly soluble in water

H₂SO₄ conc. — blue

NaOH conc. — blue

Discoverer — de la Harpe 1893

Phenocyanine TC (DH)

Dyes chromed cotton blue

Durand & Huguenin, *BP* 24802/93, 15064/94; *USP* 547173, 585934; *FP* 231316 and addn.; *GP* 77452, 79839, (*Fr.* 4, 495, 499)

Ciba, *BP* 15751/15; *USP* 1227407

51150 Mordant Dye

Phenocyanine sulfonic acids

Sulfonate phenocyanines, e.g. Phenocyanine TC (**C.I.51145**) with sulfites

H₂SO₄ conc. — blue; on dilution — reddish violet and ppt.

Aqueous solution + NaOH — violet

Discoverer — de la Harpe 1893

Phenocyanine TV (DH)

Dyes wool and silk from an acid bath, or chromed wool, silk and cotton, blue

Durand & Huguenin, *BP* 24802/93, 15064/94, 16301/95; *USP* 585934; *FP* 231316 and addn.

Soluble in water (blue)

51155 C.I. Mordant Blue 46 (Blue)

Condensation products of gallocyanines with 2-naphthol-6-sulfonic acid and subsequent oxidation

Example — Celestine Blue B (**C.I.51050**) condensed with 2-naphthol-6-sulfonic acid

Discoverer — de la Harpe 1893

Durand & Huguenin, *BP* 24802/93, 15064/94; *USP* 531148; *FP* 231316 and addn.; *GP* 77452, 79839 (*Fr.* 4, 495, 499)

FDX 885 — Gallazin A

Soluble in water (blue)

H₂SO₄ conc. — blue; on dilution — violet with violet ppt.

Aqueous solution + NaOH — violet;

+ HCl — red with ppt.

51160 Mordant Dye

React Celestine Blue B (**C.I.51050**) with aniline, sulfonate, and convert to the sodium salt

H₂SO₄ conc. — reddish violet; on dilution — carmine red and ppt.

Aqueous solution + NaOH — redder solution

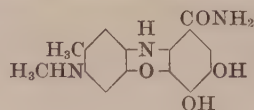
Discoverer — Bierer 1894

Coreine AB, ABN, AR (DH)

Dyes chromed wool and cotton greenish blue

Durand & Huguenin, *BP* 10333/94, 3854/95; *USP* 534809, 551885; *FP* 227509, 242956; *GP* 80434, 87935, (*Fr.* 4, 489, 486)

Soluble in water (blue)

51165 C.I. Mordant Violet 58 (Dull violet)

Heat *N*-methyl-4-nitroso-*o*-toluidine hydrochloride in excess with gallamide, and reduce the product to the *leuco*-compound. Render soluble as the hydrochloride

Discoverers — de la Harpe and Burckhardt 1907

Durand & Huguenin, *BP* 19003/07; *USP* 898040; *FP* 379761; *GP* 201906 (*Fr.* 9, 240)

Vlies, *JSDC*, 29 (1913), 320

Soluble in water (pale green)

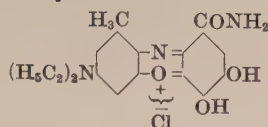
H₂SO₄ conc. — pale violet red (violet blue with addition of MnO₂);

on dilution — pale yellowish red

Aqueous solution + NaOH — oxidation to a turbid violet red

51170

Mordant Dye



React *N,N*-diethyl-4-nitroso-*m*-toluidine with gallamide

Discoverer — I.G.

Meta Celestine Blue

BIOS 1433, 135

FIAT 764 — Metacoelestinblau

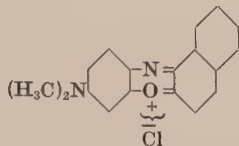
Solubilities and reactions similar to those of Celestine Blue B (C.I.51050)

51175

C.I. Basic Blue 6 (Reddish navy)

Classical name Meldola's Blue

Zinc double chloride of



React 2-naphthol with an excess of *N,N*-dimethyl-*p*-nitrosoaniline hydrochloride in hot ethanol, and convert the product into the zinc double chloride salt

Discoverer — Meldola 1879

FIAT 764 — Echtneublau 3R

Meldola, *Ber.* **12** (1879), 2065; *JCS*, **39** (1881), 37

Nietzki & Otto, *Ber.* **21** (1888), 1744

Witt, *Ber.* **23** (1890), 2247

Hirsch & Kalckhoff, *Ber.* **23** (1890), 2992

Nietzki & Bossi, *Ber.* **25** (1892), 2994

Hantzsch, *Ber.* **38** (1905), 2148

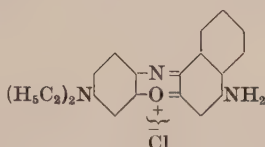
Thorpe, *JCS*, **91** (1907), 324

Soluble in water (bluish violet) and ethanol (blue)
H₂SO₄ conc. — blackish green; on dilution — blue
Aqueous solution + NaOH — brown flocculent ppt.

51180

C.I. Basic Blue 12 (Bright blue)

Classical name Nile₃ Blue



React 5-diethylamino-2-nitrosophenol hydrochloride with 1-naphthylamine hydrochloride

Discoverer — Reissig 1888

Badische Co., *BP* 4476/88, 11046/91; *USP* 431541; *FP* 189359;

GP 45268 (*Fr.* **1**, 173), 74391 (*Fr.* **3**, 381)

Bayer Co., *FP* 198598; *GP* 49844 (*Fr.* **2**, 177)

FIAT 764 — Nilblau BX

Knecht, *JSDC*, **4** (1888), 96

Möhlau & Ullmann, *Ann.* **289** (1895), 111

Thorpe, *JCS*, **91** (1907), 324

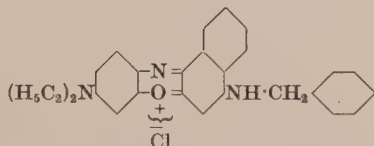
Hannay, *JSDC*, **31** (1915), 248

Kehrmann, Grillet, & Borgeaud, *Helv. Chim. Acta*, **9** (1926), 866

Very soluble in hot water (blue) and in ethanol (blue)
H₂SO₄ conc. — orange or brown; on dilution — bluish green and then blue
Aqueous solution + NaOH — red ppt. soluble in ether (brownish orange with a green fluorescence)

51185

Basic Dye



React 5-diethylamino-2-nitrosophenol hydrochloride with *N*-benzyl-1-naphthylamine hydrochloride

Discoverer — Julius 1891

Nile Blue 2B (B)

Dyes tannin-mordanted cotton greenish blue

Badische Co., *BP* 10619/91; *FP* 189359 and addn.; *GP* 60922

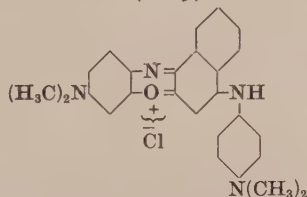
(*Fr.* **3**, 379)

Thorpe, *JCS*, **91** (1907), 324

Soluble in hot water and ethanol (greenish blue)
H₂SO₄ conc. — brownish red; on dilution — green and then blue
Aqueous solution + NaOH — brownish red ppt, soluble in ether (orange yellow with a green fluorescence)

51190

C.I. Basic Blue 10 (Navy)



(a) Condense Meldola's Blue (C.I.51175) with *N,N*-dimethyl-*p*-phenylenediamine

(b) React 2-naphthol with a very large excess of *N,N*-dimethyl-*p*-nitrosoaniline hydrochloride in hot ethanol

Discoverers — M. Hoffmann and Weinberg 1889

Cassella Co., *GP* 56722 (*Fr.* **2**, 164), 61662 (*Fr.* **3**, 375)

Witt, *Ber.* **23** (1890), 2247

Hirsch & Kalckhoff, *Ber.* **23** (1890), 2992

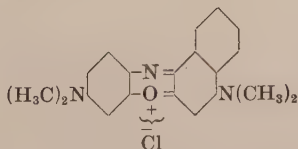
Nietzki & Bossi, *Ber.* **25** (1892), 3002

Thorpe, *JCS*, **91** (1907), 325

Soluble in water and ethanol (blue)
H₂SO₄ conc. — dirty green; on dilution — dirty violet then blue
Aqueous solution + NaOH — brown ppt, soluble in ether

51195

Basic Dye



Condense Meldola's Blue (C.I.51175) with dimethylamine and oxidise the product

Discoverers — M. Hoffmann and Weinberg 1890

New Methylene Blue GG (C)

Dyes tannin-mordanted cotton greenish blue

Cassella Co., *BP* 6946/90; *USP* 442680; *GP* 54658 (*Fr.* **2**, 165),

61662 (*Fr.* **3**, 375)

Schlarb, *Chem. Ztg.* **15** (1891), 1281, 1317

Nietzki & Bossi, *Ber.* **25** (1892), 3002

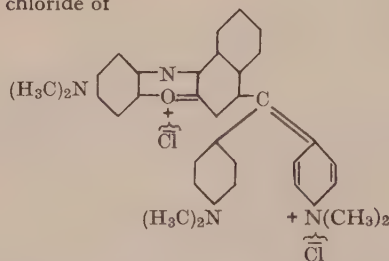
JSDC, **9** (1893), 15

Thorpe, *JCS*, **91** (1907), 324

Soluble in water (blue) and ethanol (greenish blue)
H₂SO₄ conc. — reddish brown; on dilution — green and then pure blue
Aqueous solution + NaOH — green ppt; + HCl — green

51200 Basic Dye

Zinc double chloride of

**General**

Condense 4,4'-bis(dialkylamino)benzhydrol with oxazines, oxidise the product with lead peroxide, and convert to the zinc double chloride

Example —

Condense 4,4'-bis(dimethylamino)benzhydrol with Meldola's Blue (C.I.51175)

Discoverer — E. Meyer 1892

New Fast Blue F, H (By); New Indigo Blue F, R (By)

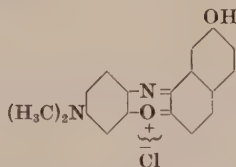
Dyes tannin-mordanted cotton greenish to reddish blue
Bayer Co., BP 11876/92; USP 499243; FP 223450; GP 68381
(Fr. 3, 137)
Möhlau, Ber. 31 (1898), 2352

Properties of the various brands

Soluble in water (blue or violet)

H₂SO₄ conc. — greenish blue; on dilution — blue to violet, or green

Aqueous solution + NaOH — dark flocculent ppt;
+ HCl — reddish blue or green

51205 Basic Dye

Condense an excess of *N,N*-dimethyl-*p*-nitrosoaniline hydrochloride with 2,7-naphthalenediol

Discoverer — Annaheim 1885

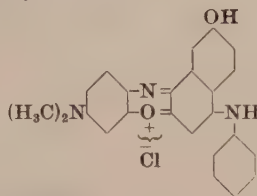
Muscarine (DH)

Dyes tannin-mordanted cotton reddish blue
Durand & Huguenin, USP 413562; FP 178364
Nietzki & Bossi, Ber. 25 (1892), 3002

Soluble in hot water (bluish violet)

H₂SO₄ conc. — bluish green; on dilution — blue to violet with violet ppt.

Aqueous solution + NaOH — yellowish brown

51210 Basic Dye

React aniline with C.I.51205

Discoverer — Bierer 1894

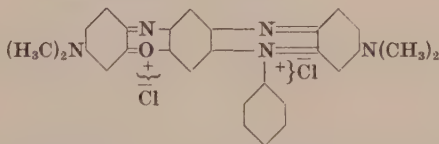
Fast Green M (DH)

Dyes tannin-mordanted cotton green of good fastness to light
Durand & Huguenin, BP 14983/94; FP 235561; GP 79122
(Fr. 4, 493)

Insoluble in water and ethanol

Soluble in acetic acid (greenish blue)

Soluble in conc. HCl (yellowish brown)

H₂SO₄ conc. — brownish violet; on dilution — orange**51215 C.I. Basic Black 7 (Black)**

Condense *N,N*-dimethyl-*p*-nitrosoaniline hydrochloride (2 mol.) with *m*-anilinophenol (1 mol.)

Discoverer — Bender 1889

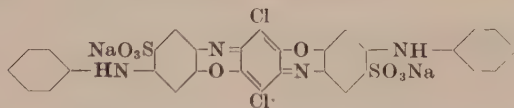
Dyes tannin-mordanted cotton blue-black of good fastness, and on a sumach-iron mordant a deep black

Leonhardt Co., BP 8264/89; FP 198511; GP 50612 (Fr. 2, 184)
Chem. Ind. (1892), 130, 412

Soluble in water (violet black) and ethanol (bluish black)

H₂SO₄ conc. — black; on dilution — violet blue with ppt.

Aqueous solution + NaOH — violet black ppt.

(b) DIOXAZINES**51300 C.I. Direct Blue 106 (Bright blue)**

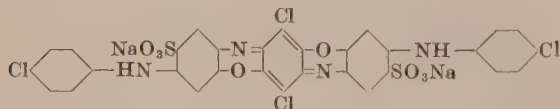
Condense 5-amino-2-anilinobenzenesulfonic acid with chloranil in water in presence of magnesium oxide as acid binding agent, cyclise the product to the dioxazine with oleum and isolate as disodium salt

Discoverers — Brunner, Greune, Thiele, and Thiess 1934

I.G., BP 448182; USP 2134505

BIOS 1482, 23. FIAT 1313, 3, 262

FIAT 764 — Siriuslichtblau FF2GL

51305 C.I. Direct Blue 190 (Bright blue)

Condense 5-amino-2-(*p*-chloroanilino)benzenesulfonic acid with chloranil, cyclise with oleum, and convert to disodium salt

Discoverers — Brunner, Greune, Thiele, and Thiess 1934

Fastness Properties (C): Acid (organic) 3, Alkali 3,
Light 5, 5-6, 6, Washing 1-2, Water 1-2

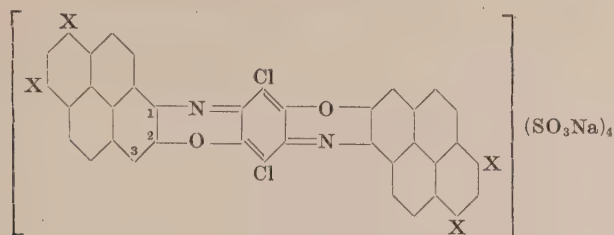
Dischargeability: not dischargeable and thus suitable for use as an illuminating colour in discharge styles

I.G., BP 448182; USP 2134505

FIAT 1313, 3, 262

FIAT 764 — Siriuslichtblau FFB

51310 C.I. Direct Blue 109 (Greenish blue)

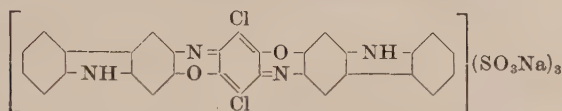


X = probable position of the SO_3Na groups

Condense 1-pyrenamine with chloranil, cyclise to dioxazine in boiling nitrobenzene, tetrasulfonate with oleum, and convert to tetrasodium salt

Discoverers — Kränzlein, Greune, and Schultheis 1932
I.G., BP 408456; USP 2016504; GP 606672 (*Fr.* 21, 1187)
BIOS 960, 79. FIAT 1313, 3, 261
FIAT 764 — Siriuslichtblau F3GL

51315 C.I. Direct Blue 107 (Bright reddish blue)



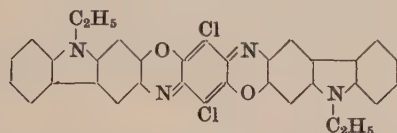
Condense 3-aminocarbazole with chloranil, cyclise by heating with *p*-toluenesulfonyl chloride in nitrobenzene for 5 hours at 207–209°C, trisulfonate with oleum, and isolate as trisodium salt

Note — Cyclisation for Sirius Supra Violet F3BL is carried out in concentrated sulfuric acid, and the product exhibits only minor differences from Sirius Supra Blue F3RL

Discoverers — Kränzlein, Greune, and Thiele 1928
I.G., BP 313094, 367389, 415749; USP 2026092, 2066915,
2077887; GP 517194 (*Fr.* 17, 942), 600102 (*Fr.* 21, 796),
616661 (*Fr.* 20, 1042)
BIOS 1482, 25. FIAT 1313, 3, 260
FIAT 764 — Siriuslichtblau F3RL, Siriuslichtviolett F3BL

Soluble in water (blue)

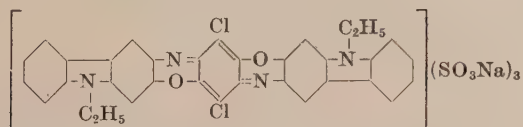
51319 C.I. Pigment Violet 23 (Bluish violet)



Condense 3-amino-9-ethylcarbazole with chloranil in trichlorobenzene

BP 387565 (IG)
GP 946560 (1952)
BIOS 960, 75
FIAT 1313, 3, 264
Jennison, J. D., PhD Thesis, Leeds 1963
Venkataraman 787

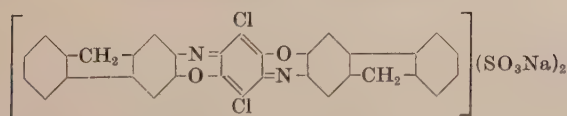
51320 C.I. Direct Blue 108 (Bright blue)



Condense 3-amino-9-ethylcarbazole with chloranil in pyridine, and simultaneously cyclise and rather more than trisulfonate with 99.5% sulfuric acid (for **Sirius Light Blue FFGL**), or condense and cyclise in *o*-dichlorobenzene with *p*-toluenesulfonyl chloride, and rather more than trisulfonate as above (for **Sirius Light Blue FFRL**), and convert to the trisodium salt. Chemically the two products are identical

Discoverers — Kränzlein, Greune, and Thiele 1928
I.G., BP 313094, 367389; USP 2026092; GP 517194 (*Fr.* 17,
942), 616661 (*Fr.* 20, 1042)
BIOS 960, 70. FIAT 1313, 3, 259
FIAT 764 — Siriuslichtblau FFGL, FFRL

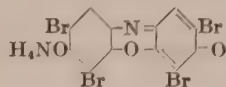
51325 C.I. Direct Violet 54 (Bright violet)



Condense 2-fluorenamine with chloranil, cyclise in boiling *o*-dichlorobenzene (or nitrobenzene) with *p*-toluenesulfonyl chloride, disulfonate with oleum, and convert to disodium salt

Discoverers — Kränzlein, Greune, Schultheis, and Langbein 1933
BP 437283; USP 2082344; GP 637020 (*Fr.* 23, 710)
FIAT 764 — Siriuslichtviolett FRL

Soluble in water (violet)

51400 Acid Dye

Condense 4-nitrosoresorcinol with resorcinol in presence of concentrated sulfuric acid, brominate the resorufin formed, and convert to the ammonium salt

[Note — **Lackmold** is also obtained by heating resorcinol with sodium nitrite

Benedikt & Julius, *Mhft. Chem.* **5** (1884), 534; *Ber.* **17** (1884), 492

Traub & Hock, *Ber.* **17** (1884), 2615]

Discoverers — Weselsky and Benedikt 1880

Fluorescent Blue (S) (SCI), Resorcine Blue (SCI), Iris Blue B

Dyes silk and wool in the presence of a weak acid

Fastness Properties: Light, good; Washing, good

Used as an indicator

Bindschedler & Busch, *BP* 939/81; *GP* 14622 (*Fr.* **1**, 563)

Weselsky, *Ann.* **162** (1872), 273

Weselsky & Benedikt, *Mhft. Chem.* **1** (1880), 886; **5** (1884), 605

Brunner and Kramer, *Ber.* **17** (1884), 1847, 1867, 1875

JSDC, **1** (1885), 42

Nietzki, Dietze, & Mäckler, *Ber.* **22** (1889), 3030

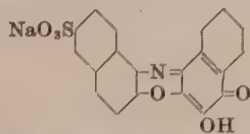
Nietzki & Mäckler, *Ber.* **23** (1890), 718

Nietzki, *Ber.* **24** (1891), 3366

Soluble in water (reddish violet with a green fluorescence)

H₂SO₄ conc. — blue; on dilution — violet with reddish brown ppt.

Aqueous solution + HCl — yellowish brown ppt.

51405 Mordant Dye

Boil an aqueous sodium carbonate solution of 3,4-dioxo-1-naphthalenesulfonic acid and 1-amino-2-naphthol-6-sulfonic acid

Discoverer — Elsässer 1895

Alizarine Green G (WDC)

Dyes chromed wool green

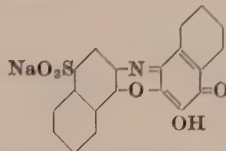
Dahl Co., *BP* 5153/95; *FP* 246450; *GP* 82097, 82740, (*Fr.* **4**, 500, 502)

Reverdin & de la Harpe, *Ber.* **25** (1892), 1400; **26** (1893), 1279

Soluble in hot water (greyish green)

H₂SO₄ conc. — bluish green; on dilution — blue to violet with bluish red ppt.

Aqueous solution + NaOH — brownish violet ppt.

51410 Mordant Dye

Boil an aqueous sodium carbonate solution of 3,4-dioxo-1-naphthalenesulfonic acid and 2-amino-1-naphthol-4-sulfonic acid

Discoverer — Elsässer 1895

Alizarine Green B (WDC)

Dyes chromed wool green

Dahl Co., *BP* 5153/95; *FP* 246450; *GP* 82740 (*Fr.* **4**, 502)

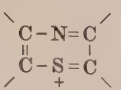
Soluble in water (green)

H₂SO₄ conc. — dull bluish violet; on dilution — yellowish green with red ppt.

Aqueous solution + NaOH — green flocculent ppt.

NOTES

THIAZINE COLOURING MATTERS

The chromophore of this class is the thiazine ring, , which forms the central ring of a condensed three ring system whose outer pair may be benzene or naphthalene nuclei. Auxochromes when introduced *meta* to the sulfur atom afford basic dyes of violet, blue, or green hues, which, in many cases, are marketed as zinc double chloride salts. The amino- or substituted amino-thiazines are basic dyes for wool and silk and for tannin-mordanted cotton. When gallic acid or dihydroxynaphthalene derivatives are used as components, valuable chrome-mordant dyes are formed.

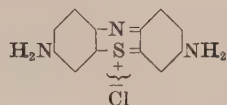
The thiazines are also used for microscopic stains and medicinally, and a recent extension is into the vat dyeing class.

Literature

As for the Azine class, p. 3409

52000 Basic Dye

Classical name **Lauth's Violet**



- (a) Oxidise *p*-phenylenediamine in acid solution with ferric chloride in presence of hydrogen sulfide
- (b) Fuse *p*-phenylenediamine with sulfur, and oxidise the product
- (c) Oxidise a mixture of *p*-phenylenediamine and aniline in presence of sodium thiosulfate

Discoverer — Lauth 1876

Lauth's Violet

Dyes tannin-mordanted cotton violet

Bernthsen, *USP* 282835, 282836, 286526, 286527; *GP* 25150 (*Fr.* 1, 252)

Lauth, *Bull. Soc. chim.* 26 (1876), 422; *Compt. rend.* 82 (1876), 1441

Koch, *Ber.* 12 (1879), 2069

Bernthsen, *Ber.* 16 (1883), 2896; 17 (1884), 615, 2854; *Ann.* 230 (1885), 108

Fränkel, *Dissertation*, Zürich, 1885; cf. *JSDC*, 2 (1886), 28

Hantzsch, *Ber.* 38 (1905), 2148

Kehrmann, *Ber.* 39 (1906), 921

Kehrmann, Havas, & Grandmougin, *Ber.* 47 (1914), 1883

Kehrmann & Zybs, *Ber.* 52 (1919), 130

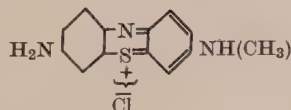
Rabinowitch & Epstein, *JACS*, 63 (1941), 69

Slightly soluble in cold, more soluble in hot water (violet)
H₂SO₄ conc. — yellowish green; on dilution — blue then violet
Aqueous solution + NaOH — brownish red ppt.

52002 Basic Dye

Azur C (EG)

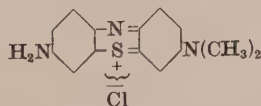
Used as a laboratory stain



Prepared by oxidation of Methylene Blue (C.I. 52015)

52005 Basic Dye

Formerly believed to be the zinc double chloride of



but stated by Formánek to be a mixture of Lauth's Violet (C.I.52000) and Methylene Blue (C.I.52015)

Oxidise a mixture of *p*-phenylenediamine and *N,N*-dimethyl-*p*-phenylenediamine in acid solution with ferric chloride in presence of hydrogen sulfide

Discoverer — Greppin 1886

Azur A (EG)

Dyes tannin-mordanted cotton bluish violet

Used as a laboratory stain

Geigy, *USP* 368716; *FP* 180487

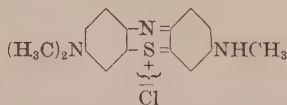
Formánek, *Z. Farb. u. Textilchem.* 4 (1905), 33, 61

Soluble in water (bluish violet)

H₂SO₄ conc. — yellowish green; on dilution — blue then bluish violet

Aqueous solution + NaOH — more violet and then dull violet ppt.

52010 Basic Dye



Oxidise a boiling aqueous acid solution of Methylene Blue (**C.I. 52015**) with sodium dichromate

H₂SO₄ conc. — green; on dilution — blue
Aqueous solution + NaOH — violet ppt.

Discoverer — Bernthsen 1885
Azur B (EG)

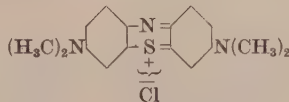
Dyes tannin-mordanted cotton reddish blue
Used as a laboratory stain
Badische Co., *GP* 184445 (*Fr.* 9, 257);
cf. Ciba, *FP* 389654
Bernthsen, *Ann.* 230 (1885), 169; *Ber.* 39 (1906), 1804
Simon, *Dissertation*, Zürich, 1885
O. Fischer & Hepp, *Ber.* 38 (1905), 3435
Hantzsch, *Ber.* 39 (1906), 156
Kehrmann & Duttonhöfer, *Ber.* 39 (1906), 925, 1403
Kehrmann, Havas, & Grandmougin, *Ber.* 46 (1913), 2137
Vlies, *JSDC*, 29 (1913), 320
Tribondeau & Dubreuil, *Compt. rend.* 164 (1917), 551
Scott & French, *The Military Surgeon*, Aug. and Sept. 1924
MacNeal & Killian, *JACS*, 48 (1926), 740

Soluble in water (blue), and slightly soluble in ethanol (reddish brown fluorescence)

52015 C.I. Basic Blue 9 (Bright greenish blue) C.I. Solvent Blue 8 (Greenish grey)

Classical name Methylene Blue

Zinc double chloride of



Convert *N,N*-dimethyl-*p*-phenylenediamine by treatment with dichromate in the presence of sodium thiosulfate (preferably with addition of aluminium sulfate) to the thiosulfonic acid (2-amino-5-dimethylaminophenyl thiosulfate), then convert the product with dichromate and *N,N*-dimethylaniline to the indamine-thiosulfonic acid, cyclise and oxidise with dichromate and copper sulfate (or MnO₂), and isolate as zinc double chloride (2 C₁₆H₁₈N₃SCl, ZnCl₂, H₂O)

Scott & French, *The Military Surgeon*, Aug. and Sept. 1924
Proeschner & Krueger, *J. Lab. Clin. Med.* 10 (1924), 153
Baker, Davidson, & Balmain, *JSDC*, 41 (1925), 269
French, *Ind. Eng. Chem.*, 18 (1926), 298
Tickner, *Div. of Dye Chem. ACS*, April, 1927
Drew & Head, *JCS* (1933), 248
Lewis & Bigeleisen, *JACS*, 65 (1943), 1144
Michaelis & Granick, *JACS*, 67 (1945), 1212
Fierz-David & Blangey, *Farbenchemie* (1952), 303
Lubs, *The Chemistry of Synthetic Dyes and Pigments* (1955), 266

Standard

India IS 2230 (Dye, methylene blue, for ink industry)

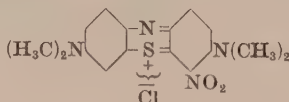
Soluble in water and less readily soluble in ethanol (blue)
H₂SO₄ conc. — yellowish green; on dilution — blue
Aqueous solution + NaOH — violet and dull violet ppt.

Discoverers — Caro 1876; Hepp 1882; Ullrich 1885; Bernthsen 1887
Badische Co., *BP* 3751/77, 10314/88, 8221/93; *USP* 204796;
FP 122720; *GP* 1886 (*Fr.* 1, 247), 45839, 46805, 47374,
(*Fr.* 2, 144, 152, 149)
Oehler, *BP* 4048/82; *USP* 270311; *GP* 24125 (*Fr.* 1, 249)
M.L.B., *BP* 43/86; *USP* 362592, 366639, 366640, 384480;
FP 173137, 181827; *GP* 38573, 39757, (*Fr.* 1, 254, 257)
Bayer Co., *GP* 347376 (*Fr.* 14, 1384)
*BIO*S 1433, 11, 15. *FIAT* 1313, 2, 372
FIAT 764 — Methylenblau, IaD, med., ex. kz.
Koch, *Ber.* 12 (1879), 592
Bernthsen, *Ber.* 16 (1883), 1025, 2896; 17 (1884), 611, 2854, 2860;
Ann. 230 (1885), 137, 169; 251 (1889), 1
Ewer & Pick, *JSDC*, 1 (1885), 242
Fränkel, *Dissertation*, Zürich, 1885; cf. *JSDC*, 2 (1886), 28
Mühlhäuser, *Dingl.* 262 (1886), 371
Andresen, *Ber.* 19 (1886), 2212
Miolati, *Ber.* 28 (1895), 1698
Schmidlin, *Compt. rend.* 139 (1904), 676
Knecht, 21 (1905), 9
Hantzsch, *Ber.* 38 (1905), 2150
Landauer, *Dissertation*, München, 1909
Hibbert, *JSCI*, 28 (1909), 189
Landauer & Weil, *Ber.* 43 (1910), 198
Sinnat, *Analyst*, 35 (1910), 309; 37 (1912), 252
Atack, *JSDC*, 29 (1913), 9; 31 (1915), 283, 203; *Analyst*, 38
(1913), 99; *JCS*, 103 (1913), 1319
Kehrmann, Havas, & Grandmougin, *Ber.* 47 (1914), 1884
Hannay, *JSDC*, 31 (1915), 248
Kehrmann, *Ber.* 49 (1916), 53; cf. *JSDC*, 32 (1916), 174
Woker & Maggi, *Ber.* 50 (1917), 1322
Seidell, *JACS*, 40 (1918), 312
Miller, *Col. Tr. J.* 62 (1918), 395
Wales & Nelson, *JACS*, 45 (1923), 1659

52020 C.I. Basic Green 5 (Dull bluish green)

Classical name Methylene Green

Zinc double chloride of



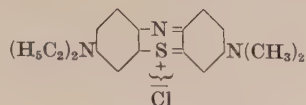
Treat Methylene Blue (**C.I. 52015**) in hydrochloric acid with sodium nitrite, then with nitric acid, and isolate as zinc double chloride (*FIAT* 764)

Discoverer — Ullrich 1886
M.L.B., *BP* 8992/86; *FP* 177331; *GP* 38979 (*Fr.* 1, 266)
FIAT 764 — Methylengruen Ia
Gnehm & Walder, *Ber.* 39 (1906), 1020
Grandmougin & Walder, *Z. Farb.-Ind.* 5 (1906), 285
Heilmann Co. & Battagay, *Bull. Soc. ind. Mulhouse*, 76 (1906), 362
Gnehm & Walder, *J. prakt. Chem.* 76 (1907), 402
Landauer, *Ber.* 43 (1910), 202
Fierz-David & Blangey, *Farbenchemie* (1952), 306

Soluble in water (greenish blue)
Slightly soluble in ethanol (greenish blue)
H₂SO₄ conc. — dark green; on dilution — greenish blue
Aqueous solution + NaOH — violet with violet black ppt.

52025 C.I. Basic Blue 25 (Dull greenish blue)

Zinc double chloride of



Convert *N,N*-dimethyl-*p*-phenylenediamine by treatment with dichromate in the presence of sodium thiosulfate to the thiosulfonic acid, then convert the product with dichromate and *N,N*-diethylaniline hydrochloride to the indamine-thiosulfonic acid, cyclise and oxidise with dichromate and copper sulfate, and isolate as zinc double chloride

Discoverer — Ullrich 1885

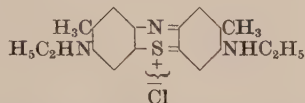
M.L.B., *BP* 43/86; *USP* 362592, 366639, 366640; *FP* 173137, 181827; *GP* 38573, 39757, (*Fr.* 1, 254, 257), 46805, 47345, (*Fr.* 2, 152, 153)

FIAT 764 — Thioninblau GO

Soluble in water and less soluble in ethanol (blue)
 H_2SO_4 conc. — yellowish green; on dilution — blue
 Aqueous solution + NaOH — violet with violet ppt.

52030 C.I. Basic Blue 24 (Bright blue)

Zinc double chloride of



Convert *N*²-ethyltoluene-2,5-diamine by treatment with dichromate in the presence of sodium thiosulfate to the thiosulfonic acid (2-amino-5-(ethylamino)-*p*-tolyl thiosulfate), then convert the product with dichromate and *N*-ethyl-*o*-toluidine hydrochloride to the indamine-thiosulfonic acid, cyclise and oxidise with dichromate and copper sulfate, and isolate as zinc double chloride

Discoverer — Weinberg 1891

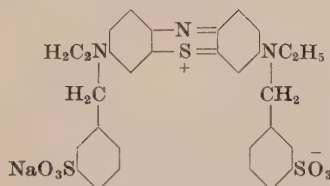
Cassella Co., *BP* 8407/91; *USP* 469329; *FP* 211821; *GP ap.* C3603 (*Fr.* 3, 360)

BIOS 1433, 8. FIAT 1313, 2, 373

FIAT 764 — Methylenblau NNX

Kehrmann, *Ber.* 39 (1906), 1407Hannay, *JSDC*, 31 (1915), 248

Soluble in water (violet blue cold, pale blue hot) and ethanol (greenish blue)
 H_2SO_4 conc. — yellowish green; on dilution — blue
 Aqueous solution + NaOH — chocolate brown ppt.

52035 Acid Dye

Oxidise α -(*p*-amino-*N*-ethylanilino)-*m*-toluenesulfonic acid with sodium dichromate in presence of sodium thiosulfate, oxidise the product formed together with α -(*N*-ethylanilino)-*m*-toluenesulfonic acid, cyclise and oxidise with dichromate, and isolate as the sodium salt

Discoverer — Weinberg 1890

Thiocarmine R (MLy) (C)

Dyes wool and silk in presence of acid

Fastness Properties: Light, poor; Milling, moderate

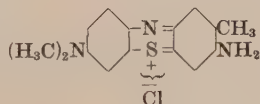
Cassella Co., *BP* 4596/90; *USP* 434493; *FP* 204395; *GP ap.* C3264 (*Fr.* 2, 156)

von Perger, *Mitt. Gew. Mus.* (1891), 202; cf. *JSCI*, 11 (1892), 30Schönholzer, *Dissertation*, Zürich, 1907Gnehm & Schönholzer, *J. prakt. Chem.* 76 (1907), 498

Soluble in water (blue)
 Slightly soluble in ethanol
 H_2SO_4 conc. — grass green; on dilution — bright blue

52040 C.I. Basic Blue 17 (Bright reddish blue)

Zinc double chloride of



Convert *N,N*-dimethyl-*p*-phenylenediamine by treatment with dichromate in the presence of sodium thiosulfate to the thiosulfonic acid, then convert the product with dichromate and *o*-toluidine to the indamine-thiosulfonic acid, cyclise and oxidise with dichromate and copper sulfate, and isolate as zinc double chloride

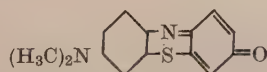
Discoverers — Dändliker and Bernthsen 1888

Badische Co., *BP* 10314/88; *USP* 416055; *GP* 47374 (*Fr.* 2, 149)M.L.B., *GP* 47345 (*Fr.* 2, 153)

FIAT 764 — Toluidinblau

Michaelis & Granick, *JACS*, 67 (1945), 1212

Soluble in water (bluish violet) and ethanol (blue)
 H_2SO_4 conc. — yellowish green; on dilution — blue
 Aqueous solution + NaOH — dull violet ppt.

52041 Basic Dye

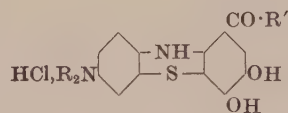
Discoverer — Bernthsen 1885

Methylene Violet (EG)

A laboratory stain

52045 Mordant Dye

General formula

R = CH₃, C₂H₅, etc.; R' = OH, OCH₃, NH₂

React gallic acid or its derivatives with the sodium salt of 2-amino-5-dimethylamino(or diethylamino)phenyl thiosulfate

Discoverers — de la Harpe and Burckhardt 1906

Leucogallothianine DH (DH)

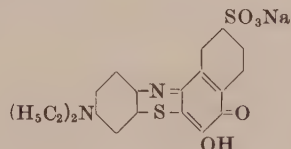
Dyes chromed wool blue to violet

Durand & Huguenin, *BP* 20397/06; *USP* 842303; *FP* 370294; *GP* 189479 (*Fr.* 9, 257); cf. Nietzki, *GP* 73556 (*Fr.* 3, 360), and M.L.B., *BP* 5692/93
Nietzki, *GP* 76923, 79172, (*Fr.* 4, 455, 257)

Soluble in hot water (pale violet blue)

H₂SO₄ conc. — red; on dilution — reddish violet

Aqueous solution + NaOH — oxidised to a bright bluish violet

52050 Mordant DyePrecursor, forming *in situ*React 3,4-dihydro-3,4-dioxo-1,7-naphthalenedisulfonic acid with 2-amino-5-diethylaminophenyl thiosulfate in cold faintly alkaline solution; the indophenol type precursor thus obtained is used directly for printing on mordanted cotton, where it forms the thiazine dye *in situ*

Discoverer — Böniger 1893

Indochromogen S (S)

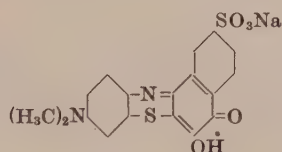
Dyes chromed cotton blue

Sandoz, *BP* 3886/94; *FP* 234828; 234838; *GP* 103574, 105566, 109273, (*Fr.* 5, 345, 346, 347)

Soluble in water (reddish violet)

H₂SO₄ conc. — greenish yellow; on dilution — brownish yellow

Aqueous solution + NaOH — dull violet changing to blue on boiling

52055 C.I. Mordant Blue 51 (Greenish navy)

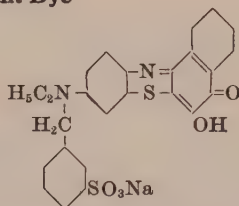
Condense 5,6-dihydro-5,6-dioxo-2-naphthalenesulfonic acid with 2-amino-5-dimethylaminophenyl thiosulfate, and convert the condensation product to the thiazine dye

Discoverer — Heymann 1892

Bayer Co., *BP* 825/93, 4757/93, 6035/93, 6035A/93, 8093/93; *USP* 524322, 524323; *FP* 227675; *GP* 83046, 84232, 84233, 84849, (*Fr.* 3, 1011, 1013, 1014, 1016), 86717 (*Fr.* 4, 456)

FIAT 764 — Brillantalizarinblau G

Soluble in hot water (blue)

H₂SO₄ conc. — green; on dilution — violet ppt.**52060 Mordant Dye**Condense 1,2-naphthoquinone with α-[4-amino-N-ethyl-3-(sulfothio)anilino]-*m*-toluenesulfonic acid, and convert the condensation product to the thiazine dye

Discoverer — Heymann 1892

Brilliant Alizarin Blue R (By)

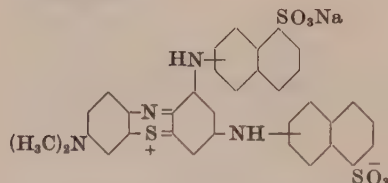
Patents as for Brillantalizarinblau G (C.I.52055)

FIAT 764 — Brillantalizarinblau R

Soluble in water (blue)

H₂SO₄ conc. — green; on dilution — violet blue ppt.

Aqueous solution + HCl — blue ppt.

52065 Acid DyeOxidise 2-amino-5-dimethylaminophenyl thiosulfate and 6,6' (or 7,7')-(*m*-phenylenediimino)di-1-naphthalenesulfonic acid (made by sulfonating the condensation product from *m*-phenylenediamine and 2-naphthol) with sodium dichromate*Note* — For preparation of the second intermediate see *GP* 77227 (*Fr.* 3, 324)

Discoverer — Elsässer 1896

Urania Blue (WDC)

Dyes wool and silk in presence of acid

Dahl Co., *BP* 13118/96; *USP* 607408; *FP* 244671, 257259; *GP* 90275 (*Fr.* 4, 467)

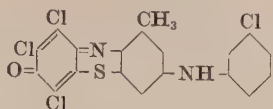
Soluble in water (blue)

Slightly soluble in ethanol

H₂SO₄ conc. — brownish green; on dilution — blue

Aqueous solution + HCl — colour unchanged, no ppt.

52100 **C.I. Vat Violet 19** (*Bluish violet*)



Discoverer — I.G.

BIO S 987, 132

FDX 885 — Indanthrendruckblau 3R

Sulfurise *o*-toluidine hydrochloride with sulfur chloride (S₂Cl₂), condense the product with *m*-chloroaniline, then treat with ethanolic sodium hydroxide, and condense the zinc salt of the resulting 2-amino-5-(*m*-chloroanilino)-*m*-toluenethiol with chloranil

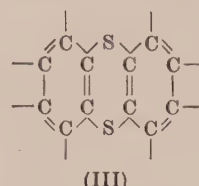
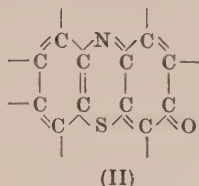
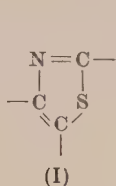
NOTES

NOTES

SULFUR DYES

The dyes which appear in this section are those obtained by heating a variety of organic compounds with sulfur or alkali polysulfides. This process known as sulfurisation or thionation produces substances of indeterminate chemical constitution. They cannot be assigned a structural formula as is the case with most other dyes and it is not even possible to assign to them a precise chromophore.

However, the research carried out by Gnehm and Kaufler¹, Herz², Fierz-David and co-workers³, and Zerweck and co-workers⁴ on the chemical characterisation of representative sulfur dyes has shown that some of the most important commercial types contain, as chromophores, ring structures of the thiazole (I), thiazone (3*H*-isophenothiazin-3-one) (II), or thianthrene (III) types —



A significant part of the total sulfur is attached to the aromatic ring in the form of disulfide or disulfoxide bridges. These linkages are converted in the sodium sulfide vat to --SNa groups which on air oxidation form the final sulfides *in situ*.

The quality and characteristics of the dyes forming the end products of sulfurisation are controlled by three distinct variables —

- (a) the organic compound or compounds selected for sulfurisation
- (b) the conditions of sulfurisation
- (c) the conditions of isolation or work-up

Of these three variables the organic compound or compounds selected for sulfurisation are the most important in determining the general type and properties of the end product, and therefore it is convenient to classify sulfur dyes in accordance with the chemical structure of the organic starting material. Each organic compound (a) can, in some degree, be sub-classified in accordance with the other two variables. The sulfur dyes derived from aromatic intermediates have been so arranged and divided into the following groups relative to the organic compound which predominates in the manufacturing process —

- (1) Mononuclear benzenoid amino and nitro compounds (C.I.53005–53135)
- (2) Binuclear benzenoid amino and nitro compounds (C.I.53140–53160)
- (3) Substituted phenols (other than indophenols) (C.I.53165–53265)
- (4) Substituted naphthalenes (other than indophenols) (C.I.53270–53300)
- (5) Polycyclic compounds (C.I.53320–53335)
- (6) Indophenols containing —
 - (a) Two benzene nuclei (C.I.53400–53442)
 - (b) Three benzene nuclei (C.I.53450–53480)
 - (c) A naphthalene nucleus (C.I.53520–53590)
 - (d) A carbazole nucleus (C.I.53630–53640)
- (7) Acridine, azine, oxazone and thiazone compounds (C.I.53680–53830)

Whilst the above arrangement is not chosen or selected on hue it does tend to bring together sulfur dyes of similar hue.

The conditions of sulfurisation may be varied in many ways and form an integral part of the manufacturing process which results in a defined commercial product. The four sulfurisation methods used generally for the commercial production of these dyes are characterised as sulfur bake, sodium polysulfide bake, and sodium polysulfide melt in both aqueous and solvent media. Examples of these variations are given, when the information is available, against many of the dyes in this section. Other sulfurisation methods, which are more frequently used in research into chemical constitution, employ sulfur chloride or chlorosulfonic acid as the thionating agent.

Following sulfurisation the dye is precipitated by air or chemical oxidation, acidification or a combination of these methods. This stage of the process has, in some instances, an important effect on the hue of the end-product and may also influence the physical properties, particularly solubility.

Apart from some exceptional cases, the sulfur dyes are insoluble in water but soluble in an aqueous solution of sodium sulfide and are generally applied from a sodium sulfide solution, mainly to cellulosic fibres. These properties are fully described in the complementary application section "Sulphur Dyes" in Volume 3.

The sulfur dyes in this constitution volume, however, contain a few, e.g. C.I.53630 and 53640, which in terms of application are classified as vat dyes.

The sulfur dyes are represented in all the hue classification groups and particularly in the brown, blue and black groups; however, there are no true reds although there are a number with hues ranging from bordeaux through dull red to reddish brown. It is a characteristic of the sulfur dyes, that apart from a few isolated cases, the hues are dull in comparison with dyes in other chemical groups.

Leuco Sulfur Dyes

The treatment of the sulfur dyes either as paste or powder with various reducing agents yields products, described in this Index as Leuco Sulfur dyes, which are soluble in water. Amongst these are the liquid products which consist of a solution of the parent dye in sodium sulfide or mixed sulfide and hydrosulfide solution⁵. In other instances, by drying and grinding, powder dyes are produced which are water soluble but relatively unstable. A dry mixture of sodium formaldehyde sulfoxylate and alkali, instead of sodium sulfide, has also been used^{6,7}.

In another variation the parent dye is mixed with small quantities of selected reducing agents. This gives dyes which, although not water soluble, are easily reduced under mildly alkaline reducing conditions⁸.

All of these products have been given the same C.I. Constitution Number as the parent dyes.

Solubilised Sulfur Dyes

Thiosulfonic acid derivatives of sulfur dyes, described as Solubilised Sulfur Dyes, have been produced by the action of sodium sulfite or bisulfite on the parent dye. They have low substantivity for cotton and are applied by conversion to the leuco form with sodium sulfide or a mildly alkaline reducing agent. The application methods used for Condense Sulfur Dyes, which also contain functional thiosulfonic acid groups, may also be used for selected Solubilised Sulfur Dyes.

References

- ¹ Gnehm and Kaufler, *Ber.*, **37** (1904), 2617, 3032
- ² Weinberg (Studies by Herz, Kalischer, Schubert and Ritter), *Ber.*, **63A** (1930), 117
- ³ Fierz-David, *JSDC*, **51** (1935), 50-63
Fierz-David and Bernasconi, *Helv. Chim. Acta*, **15** (1932), 287; Keller and Fierz-David, *ibid.*, **16** (1933), 585; Valpiana, *thesis*, Eidg. Tech. Hochschule, Zurich (1946)
- ⁴ Zerweck, Ritter and Schubert, *Z. angew. Chem.*, **60A** (1948), 141
- ⁵ Southern Dyestuff Corporation, *USP* 2130415
- ⁶ Geigy, *BP* 470156 (appl. 33686)
- ⁷ *FIAT* 1313, **3**, 252-257
- ⁸ I.G., *BP* 705936

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Fierz-David, *Künstliche Organische Farbstoffe* (1926)
Lange, *Die Schwefelfarbstoffe* (1925)
Lubs, *The Chemistry of Synthetic Dyes and Pigments* (1955), Chapter 6
Venkataraman, *The Chemistry of Synthetic Dyes*, Vol. 2 (1952), Chapter XXXV
BIOS Misc. 55
BIOS 983
BIOS 1155
FIAT 764, Reels 82 CC (*PB* 74026), 92 AA (*PB* 70276) and 186 C (*PB* 25626)
FIAT 1313 — Vol. 2 & 3
FDX 885
PB 74181
PB 74234
Vlies, *JSDC*, **29** (1913), 316
Rowe, *JSDC*, **33** (1917), 9-17
Hodgson, *JSDC*, **52** (1936), 76
Crist and Rupp, *Am. Dy. Rep.*, **46** (1957), 83-86

DYES FROM NATURAL PRODUCTS AND ORGANIC WASTES

53000 C.I. Sulphur Brown 1 (*Brownish olive* → *Yellowish brown*)

Heat brown coal in a rotary baker with sodium polysulfide and sulfur (*BIOS* 983, 44)

Heat organic refuse with sulfur and sodium sulfide at temperatures varying from 100-350°C. The higher the temperature the darker the product

Other alternative intermediates are lignite, sawdust, bran, sulfite cellulose waste liquors (free from calcium), oils, fats and fatty acids

Cachou De Laval (The first sulfur dye)

Appearance — black hygroscopic lumps or powder

Water — readily soluble with greenish black or brown colour but rendered insoluble by prolonged boiling

H₂SO₄ conc. — brown, with evolution of H₂S; on dilution — brown ppt.
NaOH — greenish solution

Discoverers — Croissant and Bretonnière 1873 (Cachou De Laval)
Bellerio 1898
Seidell 1899

Croissant & Bretonnière, *BP* 1489/73; *FP* 98915

Sachs, *BP* 1838/80

S.A. St. Denis, *BP* 3612/95; *USP* 549036, 549082; *FP* 244585; *GP* 88392 (*Fr.* **4**, 1052)

Bayer Co., *BP* 22417/95; *USP* 603755; *FP* 253213

Lepetit, Dollfus & Gansser, *BP* 18900/99; *FP* 290714; *GP* 118701 (*Fr.* **6**, 780)

Kalle Co., *BP* 8229/00; *USP* 687581; *FP* 300771

Allers, *FP* 356672

Redlich & Deutsch, *BP* 28862/10; *GP* 240522 (*Fr.* **10**, 296)

Robeson, *USP* 1316742

Witt & Copp, *Ber.* **7** (1874), 1746

Lepetit, *Färberztg.* **1** (1889), 128

Richardson & Aykroyd, *JSCI*, **15** (1896), 328; *JSDC*, **12** (1896), 232

Wichelhaus, *Ber.* **40** (1907), 126; **43** (1910), 2922

FIAT 764 — Immediatschwarzbraun A ex.

53001 C.I. Solubilised Sulphur Brown 1 (*Brownish olive* → *Yellowish brown*)

The thiosulfonic acid of C.I. 53000

Soluble in water

DYES FROM AROMATIC INTERMEDIATES

(1) — MONONUCLEAR BENZENOID AMINO and NITRO COMPOUNDS

53005 C.I. Sulphur Green 9 (*Dull green* → *Greenish grey*)

FIAT 764 — Immedialoliv 3B 'F'



m-Dinitrobenzene



p-Aminophenol

Bake a mixture of *m*-dinitrobenzene and *p*-aminophenol with sodium polysulfide at 260–270°C

53006 C.I. Solubilised Sulphur Green 9

(*Dull green* → *Greenish grey*)

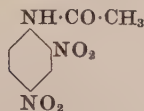
The thiosulfonic acid of C.I. 53005

Soluble in water

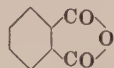
53010 C.I. Sulphur Yellow 9 (*Yellow*)

BIOS 1155, 33

FIAT 764 — Immedialgelb G ex. 'F'



2,4'-Dinitroacetanilide



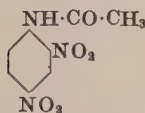
Phthalic anhydride

Add 133 parts of 2,4'-dinitroacetanilide and 93 parts of phthalic anhydride to 280 parts of sodium sulfide crystals and 94 parts of sulfur previously melted at 95°C. Add salt, heat the melt to 130°C and maintain at this temperature for 10–11 hours. Heat rapidly to 180°C and maintain for 3–4 hours until satisfactory by dye test (BIOS 1155, 33)

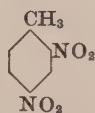
Na₂S — solubility good — yellow

53015 C.I. Sulphur Brown 46 (*Yellowish brown* → *Brown*)

FIAT 764 — Immedialorangebraun RR ex. 'F'



2,4'-Dinitroacetanilide

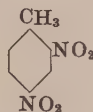


2,4-Dinitrotoluene

Bake a mixture of 2,4'-dinitroacetanilide and 2,4-dinitrotoluene with sodium polysulfide at a final temperature of 305°C

53020 C.I. Sulphur Brown 8 (*Brown*)

C.I. Leuco Sulphur Brown 8



2,4-Dinitrotoluene

Bake 2,4-dinitrotoluene with sodium polysulfide at 220–230°C for 15–20 hours and treat the product with caustic soda

Na₂S — solubility good — yellowish to reddish orange

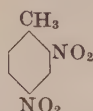
Water — partly soluble — brown

H₂SO₄ conc. — partially soluble — orange brown; on dilution — orange brown ppt.

53021 C.I. Solubilised Sulphur Brown 8 (*Brown*)

The thiosulfonic acid of C.I. 53020

Soluble in water

53025 C.I. Sulphur Brown 24 (Yellowish brown)

2,4-Dinitrotoluene

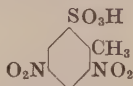


Benzidine

Water — slightly soluble

Na₂S — solubility good — yellowish brownH₂SO₄ conc. — slightly soluble — yellowish brown

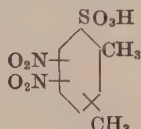
Bake a mixture of 2,4-dinitrotoluene and benzidine with sodium polysulfide at 200°C for 4 hours and treat the product with caustic soda

53030 C.I. Sulphur Brown 42 (Brown)3,5-Dinitro-*o*-toluenesulfonic acid

Water — soluble

Na₂S — yellowish brownH₂SO₄ conc. — yellowish brown; on dilution — yellowish brown

Heat the sodium salt of 3,5-dinitro-*o*-toluenesulfonic acid with aqueous sodium polysulfide

53035 C.I. Sulphur Brown 35 (Brown)

Dinitroxylenesulfonic acid

Water — soluble

Na₂S — yellowish brown; on dilution — yellowish brownH₂SO₄ conc. — yellowish brown; on dilution — yellowish brown

NaOH — yellowish brown; on dilution — yellowish brown

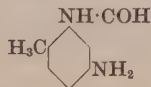
Heat the sodium salt of dinitroxylenesulfonic acid with aqueous sodium polysulfide

53037 C.I. Leuco Sulphur Yellow 7 (Yellow)*o*-Toluidine*p*-Nitroaniline

FIAT 764 — Immedialgelb 3GT

BIOS 1155, 41 (incorrectly specifies *o*-toluidine in place of the *o*-toluidine used for this dye)

Bake a mixture of 129 parts of *o*-toluidine, 55 parts of *p*-nitroaniline and 220 parts of sulfur, raising the temperature slowly during 6–8 hours to 250°C. Treat the product in aqueous caustic soda or sodium sulfide. This forms the basis of the solubilised dye

53040 C.I. Sulphur Yellow 1 (Dull reddish yellow)5'-Amino-*o*-formotoluidide

Aniline

Discoverer — Ajax Aniline Dye Mfg. Co.

Bake a mixture of 5'-amino-*o*-formotoluidide, aniline and sulfur for 48 hours at 180°C

Na₂S — solubility good — yellowish brown**53045 C.I. Sulphur Green 12 (Olive)***p*-Phenylenediamine*o*-Toluidine

Immedial Olive FFex 'F' (IG)

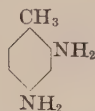
BIOS 1155, 26

FIAT 764 — Immedialoliv FF ex. 'F'

Bake a mixture of 60 parts of *p*-phenylenediamine, 46 parts of *o*-toluidine and 320 parts of sulfur at 190–230°C. Boil the product for 6 hours under reflux in aqueous sodium sulfide and precipitate with acid and air (BIOS 1155, 26)

Na₂S — yellow olive

53050 C.I. Sulphur Orange 1 (*Yellowish orange*
→ *Reddish orange*)



Toluene-2,4-diamine

Bake 1 part of toluene-2,4-diamine with 2-4 parts of sulfur at temperatures from 190-250°C for 15-24 hours and treat the crude product with aqueous caustic soda or sodium sulfide (BIOS 1155, 27-28)

The final hue depends on the temperature and the length of time of sulfuration. Higher temperatures and longer times produce orange dyes of redder hues, whilst lower temperatures and shorter times cause the formation of yellower dyes

Discoverers — Weinberg and Lange 1902

Cassella Co., BP 11771/02, 11898/02; USP 712747, 714542; FP 321122, 321183; GP 139430, 141576, 152595, (Fr. 7, 533, 534, 535)

Kalle Co., BP 16932/02; FP 323490; GP 139429, 146914, (Fr. 7, 547, 548)

BIOS 1155, 27-28

FIAT 764 — Immedialorange RRT ex. 'F'
Immedialorange C ex.

Na₂S — solubility good — orange

H₂SO₄ conc. — slightly soluble

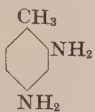
53051 C.I. Solubilised Sulphur Orange 1
(*Yellowish orange* → *Reddish orange*)

The thiosulfonic acid of C.I. 53050

Soluble in water

Na₂S soln. — yellowish orange

53055 C.I. Sulphur Brown 10 (*Brown*)
C.I. Leuco Sulphur Brown 10



Toluene-2,4-diamine

Bake a mixture of 1 part of toluene-2,4-diamine and 2 parts of sulfur for 15 hours at 210-250°C. Dissolve the product so formed in sodium sulfide and caustic soda and after adding salt, heat to 240°C during 6 hours and then to 250°C over 4 hours, allowing the water to evaporate (BIOS 1155, 38-39)

BIOS 1155, 38-39

FIAT 764 — Immedialgelbbraun G ex. 'F'

Na₂S — solubility good — brown

H₂SO₄ conc. — slightly soluble

53056 C.I. Solubilised Sulphur Brown 10 (*Brown*)

The thiosulfonic acid of C.I. 53055

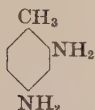
Soluble in water

H₂SO₄ conc. — orange brown with SO₂ evolved; on dilution — ppt.

NaOH — orange

Na₂S soln. — orange

53060 C.I. Sulphur Brown 2 (*Dull yellowish brown*)



Toluene-2,4-diamine



Oxalic acid

React toluene-2,4-diamine (2 mols.) with oxalic acid (1 mol.) at 200°C and bake the condensation product with sodium polysulfide at 220-300°C until the evolution of hydrogen sulfide ceases

Similar dyes are obtained by sulfurising a mixture of 3-amino-4-methyloxanilic acid and toluene-2,4-diamine in equimolecular proportions or by replacing the oxalic acid with phthalic acid, succinic acid or mercaptoacetic acid (GP 125586)

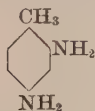
Discoverer — Ris 1900

Geigy, BP 1644/01; USP 688885; FP 306655 and addn.; GP 125586, 125587, 126964, 128659, (Fr. 6, 755, 758, 756, 757)

FDX 885 — Eclipsbraun B

Na₂S — solubility good

53065 C.I. Sulphur Brown 21 (*Yellowish brown*)
C.I. Leuco Sulphur Brown 21



Toluene-2,4-diamine



p-Nitroaniline

Bake a mixture of 80 parts of toluene-2,4-diamine, 48 parts of p-nitroaniline and 283 parts of sulfur for 10 hours at 200-210°C. Treat the product so formed in aqueous sodium sulfide (BIOS 1155, 39)

BIOS 983, 51

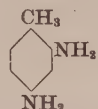
BIOS 1155, 39

FIAT 764 — Immedialgelboliv 3GR ex. 'F'

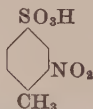
53066 C.I. Solubilised Sulphur Brown 21 (*Yellowish brown*)

The thiosulfonic acid of C.I. 53065

Soluble in water

53070 C.I. Sulphur Brown 54 (Dull yellowish brown)

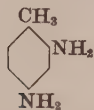
Toluene-2,4-diamine

3-Nitro-*p*-toluenesulfonic acid

Bake a mixture of toluene-2,4-diamine and 3-nitro-*p*-toluenesulfonic acid with sodium polysulfide at 275–280°C

Na₂S — orange brown

H₂SO₄ conc. — orange brown; on dilution — orange brown ppt.

53075 C.I. Sulphur Brown 23 (Brownish olive)**C.I. Leuco Sulphur Brown 23**

Toluene-2,4-diamine

*p*-Nitroaniline*p*-Phenylenediamine

Bake a mixture of 75 parts of toluene-2,4-diamine, 62.5 parts of *p*-nitroaniline, 16.2 parts of *p*-phenylenediamine and 287 parts of sulfur at 220–240°C for 10 hours. Treat the product so formed in aqueous sodium sulfide at 90–95°C, screen and precipitate with sulfuric acid

A dye having a slightly browner hue is produced in a similar manner by the use of varied quantities of intermediates as follows —

93.5 parts of toluene-2,4-diamine

47 parts of *p*-nitroaniline

40 parts of *p*-phenylenediamine

380 parts of sulfur

(BIOS 1155, 20, 43)

BIOS 1155, 20, 43

FIAT 764 — Immedialgelboliv G

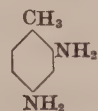
FIAT 764 — Immedialgruengelb G 'F'

Na₂S — solubility good — yellowish brown

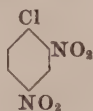
H₂SO₄ conc. — yellowish brown; on dilution — yellowish brown ppt.

53080 C.I. Sulphur Brown 22 (Dull brown)

Sulphur Dark Brown G conc. (BEL)



Toluene-2,4-diamine



1-Chloro-2,4-dinitrobenzene

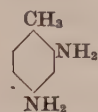
Bake a mixture of toluene-2,4-diamine and 1-chloro-2,4-dinitrobenzene with sodium sulfide and sulfur

53085 C.I. Sulphur Brown 79 (Yellowish brown → Brown)

BIOS 983, 47

BIOS 1155, 38

FIAT 764 — Immedialgelb 6RT ex. 'F'



Toluene-2,4-diamine

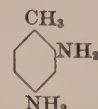
*m*-Phenylenediamine

Bake a mixture of 117 parts of toluene-2,4-diamine, 58 parts of *m*-phenylenediamine and 420 parts of sulfur for 10 hours at 230–250°C. Treat the product so formed in aqueous caustic soda and precipitate with sulfuric acid (BIOS 983, 47), (BIOS 1155, 38)

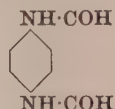
53090 C.I. Sulphur Brown 26 (Yellowish brown)

BIOS 983, 89 — Immedialgelb D

FIAT 764 — Immedialgelb DN



Toluene-2,4-diamine

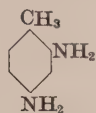
*N,N'*-*p*-Phenylenebisformamide

Bake a mixture of 3 parts of toluene-2,4-diamine, 2 parts of *N,N'*-*p*-phenylenebisformamide and 20 parts of sulfur at 210°C for 13 hours

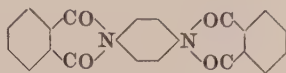
At higher temperatures the hue of the product is redder and duller and the dye is of higher tinctorial strength (BIOS 983, 89)

53091 C.I. Solubilised Sulphur Brown 26

The thiosulfonic acid of C.I. 53090

53095 Sulphur Dye (Dull yellowish orange)

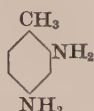
Toluene-2,4-diamine

*N,N'*-*p*-Phenylenedipthalimide

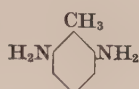
Bake a mixture of 80 parts of toluene-2,4-diamine, 34 parts of *N,N'*-*p*-phenylenedipthalimide and 334 parts of sulfur for 8–10 hours at 210–215°C, then dissolve the crude product in aqueous caustic soda at the boil and treat with aqueous sodium sulfide at 95°C (*FIAT* 764)

Immedial Orange FR (IG)

Fastness Properties (C): Acid 3–4, Acid boiling 4, Alkali 5, Boiling 4, Light 3, Perspiration 5, Stoving 3–4, Washing 4–5, Water 5

BIOS 1155, 40–41*FIAT* 764 — Immedialorange FR ex. 'F'**53100 C.I. Sulphur Brown 38 (Brown)***BIOS* 1155, 42*FIAT* 764 — Immedialgelbbraun G ex. 26

Toluene-2,4-diamine

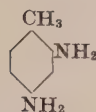


Toluene-2,6-diamine

Bake a mixture of 160 parts of toluene-2,4-diamine, 40 parts of toluene-2,6-diamine and 428 parts of sulfur for 12 hours at 245°C. Treat the product in aqueous caustic soda or sodium sulfide (*BIOS* 1155, 42)

**53105 C.I. Sulphur Yellow 6 (Dull yellow
→ Dull reddish yellow)
C.I. Sulphur Orange 3 (Dull yellowish orange)**

Discoverers — Weinberg and Lange 1903

Cassella Co., *GP* 152595 (*Fr.* 7, 535; see footnote)

Toluene-2,4-diamine



Benzidine

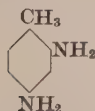
Bake a mixture of toluene-2,4-diamine and benzidine with sulfur at 220–230°C. Treat the finished melt with caustic soda, filter and precipitate with hydrochloric acid, or by blowing air through the solution. Sulfurisation at a lower temperature of a mixture containing a greater proportion of benzidine produces a dye of yellower hue

Na₂S — solubility very good — yellowish orange
H₂SO₄ conc. — partially soluble

**53106 C.I. Solubilised Sulphur Orange 3
(Dull yellowish orange)**

The thiosulfonic acid of C.I. 53105

Soluble in water

53115 C.I. Sulphur Brown 19 (Yellowish brown)**Immedial Yellow F4R extra, 4RTP extra (CFM)***BIOS* 1155, 37*FIAT* 764 — Immedialgelb 4RT ex. 'F'

Toluene-2,4-diamine



Benzidine

*m*-Nitroaniline

Bake a mixture of 85.8 parts of toluene-2,4-diamine, 42 parts of benzidine, 36 parts of *m*-nitroaniline and 600 parts of sulfur for 9 hours at 220–240°C. Treat the product in aqueous sodium sulfide and precipitate with acid (*BIOS* 1155, 37)

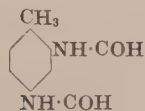
Na₂S — solubility good — reddish orange
H₂SO₄ conc. — light brown; on dilution — light brown

Note — The use of *p*-aminophenol in place of *m*-nitroaniline gives similar dyes

For fastness properties, etc. see Volume 2, pp. 2400

53120 C.I. Sulphur Yellow 2 (*Dull greenish yellow*
→ *Dull reddish yellow*)

C.I. Leuco Sulphur Yellow 2



N,N'-2,4-Tolylenebisformamide



Benzidine

Bake a mixture of 100 parts of *N,N'*-2,4-tolylenebisformamide, 67 parts of benzidine and 400 parts of sulfur at 140–150°C and raise the temperature during 15 hours to 218–220°C (BIOS 1155, 35–36)

The use of a higher temperature or a larger proportion of sulfur gives dyes having redder hues, whereas the use of less sulfur and a temperature sufficiently high to produce a steady evolution of H₂S, results in products which give greenish yellows

Discoverers — Ris and Mylius 1902

Geigy, BP 23967/02; USP 722630; FP 306655; GP 138839, 145762, 145763, 146917, (Fr. 1, 540, 541, 541, 542)

Agfa, BP 7725/04; USP 782905; FP 341798, 358017; GP 159097, 170476, (Fr. 8, 801, 802)

Vlies, JSDC, 29 (1913), 319

Mazumder & Watson, JCS, 117 (1920), 830; See JSDC, 36 (1920), 262

BIOS 1155, 35–36

FIAT 764 — Immedialgelb RR 'F'

Na₂S — solubility good

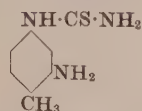
H₂SO₄ conc. — partly soluble; on dilution — yellow ppt. of sulfur

53121 C.I. Solubilised Sulphur Yellow 2
(*Dull greenish yellow* → *dull reddish yellow*)

The thiosulfonic acid of C.I. 53120

Soluble in water

53125 C.I. Sulphur Yellow 3 (*Dull reddish yellow*)



1-(3-Amino-*p*-tolyl)-2-thiourea



Benzidine

Bake a mixture of 72 parts of 1-(3-amino-*p*-tolyl)-2-thiourea, 72 parts of benzidine and 600 parts of sulfur for 10 hours at 200–210°C. Treat the product in aqueous caustic soda at 100°C and precipitate with acid (BIOS 1155, 36–37)

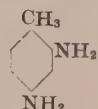
Discoverer — Badische Co. 1903

GP 153518 (Fr. 7, 533),

BIOS 1155, 36–37

FIAT 764 — Immedialgelb RT ex. 'F'

53130 Sulphur Dye (*Brown*)



Toluene-2,4-diamine



o-Aminophenol

Bake a mixture of 36.6 parts of toluene-2,4-diamine, 7 parts of *o*-aminophenol and 135 parts of sulfur at 220–230°C for 3–4 hours. Treat the product with aqueous caustic soda and sodium sulfide (BIOS 1155, 42)

Immedial Yellow Brown O (IG)

Fastness Properties (C): Acid 4, Acid boiling 4, Alkali 5,

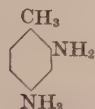
Hot pressing, 5, Light 3–4, Perspiration 4, Stoving 4,

Washing 4–5, Water (boiling) 4

BIOS 1155, 42

FIAT 764 — Immedialgelbbraun O ex. 'F'

53135 C.I. Sulphur Brown 55 (*Brownish olive*)



Toluene-2,4-diamine



p-Aminophenol



Benzidine

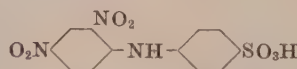
Bake a mixture of toluene-2,4-diamine, *p*-aminophenol and benzidine at 210°C with sulfur and treat the resultant product with sodium sulfide

Na₂S — brownish orange

H₂SO₄ conc. — insoluble

(2) — BINUCLEAR BENZENOID AMINO and NITRO COMPOUNDS

53140 Sulphur Dye (*Black*)



p-(2,4-Dinitroanilino)benzenesulfonic acid

Bake the sodium salt of *p*-(2,4-dinitroanilino)benzenesulfonic acid with sodium sulfide and sulfur at 220–240°C (GP 105058)

Note — A dye of similar hue and properties is obtained by sulfurising *m*-(2,4-dinitroanilino)benzenesulfonic acid in a similar melt at 200–220°C (GP 101862)

Discoverer — Elsässer 1898

Cotton Black (WDC)

Dyes cotton direct from a sodium sulfide bath fast black.

The hue and fastness of the dyeings are unaffected by aftertreatment with oxidising agents

Wulfging Dahl Co., BP 13167/98; GP 101862, 105058, (Fr. 5, 430, 431)

Water — greenish-black

Alcohol — insoluble

HCl to aqueous solution — brown ppt.

H₂SO₄ conc. — sparingly soluble — brown

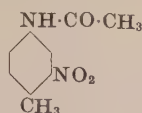
53145 C.I. Sulphur Orange 2 (Yellowish orange)

BIOS 1155, 41

FIAT 764 — Immedialorange FRR (incorrectly lists this dye as Immedialorange FFR ex. 'F')



Benzidine

3'-Nitro-*p*-acetotoluidide

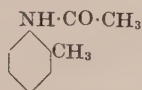
Bake a mixture of 58 parts of benzidine, 12.3 parts of 3'-nitro-*p*-acetotoluidide and 142 parts of sulfur for 12 hours at 180–230°C. Treat the product in aqueous sodium sulfide and precipitate with sulfuric acid (FIAT 764)

**53150 C.I. Sulphur Yellow 12 (Yellow)
C.I. Leuco Sulphur Yellow 12**

FIAT 764—Immedialgelb R ex. 'F'



Benzidine

*o*-Acetotoluidide

Bake a mixture of 126 parts of benzidine, 39 parts of *o*-acetotoluidide and 429 parts of sulfur for 13 hours at 230–245°C. Treat the product in aqueous caustic soda and precipitate by the addition of salt (BIOS 1155, 35)

53152 C.I. Sulphur Orange 4 (Orange)

For example —

Discoverer — Vidal

S.A. St. Denis, BP 3414/95, 23312/95; USP 561276, 561277; FP 239714; GP 82748 (Fr. 4, 1054)



2,2''-Dinitro-4,4''-biacetanilide

Bake 2,2''-dinitro-4,4''-biacetanilide with sulfur or sodium polysulfide at 200–250°C

Note — Dyes of somewhat similar properties are obtained by sulfurising 3-nitro-*p*-acetotoluidide or acetyl derivatives of *p*-diamines by a similar bake at 200–300°C (GP 82748)

Water — brown

Na₂S — yellowish brownH₂SO₄ conc. — reddish brown; on dilution — reddish brown ppt.**53160 C.I. Sulphur Yellow 4 (Yellow)
C.I. Leuco Sulphur Yellow 4**

Discoverer — Schmidt 1906

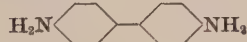
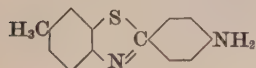
Cassella Co., BP 4097/06; USP 892455; FP 372137; GP 180162 (Fr. 8, 812)

Vlies, JSDC, 29 (1913), 319

BIOS 1155, 34

FIAT 1313, 2, 308–9

FIAT 764 — Immedialgelb GG 'F'



Benzidine

2-(*p*-Aminophenyl)-6-methylbenzothiazole

Bake a mixture of 98 parts of 2-(*p*-aminophenyl)-6-methylbenzothiazole and 77 parts of benzidine with 500 parts of sulfur for 27 hours at 190–220°C. Treat the product in aqueous caustic soda (BIOS 1155, 34)

Water — insoluble

Na₂S — solubility good — yellowish brownH₂SO₄ conc. — partly soluble — yellowish brown**53161 C.I. Solubilised Sulphur Yellow 4**

The thiosulfonic acid of C.I. 53160

(3) — SUBSTITUTED PHENOLS (Other than Indophenols)**53165 C.I. Sulphur Green 11 (Olive)**

Discoverer — Lepetit 1895

BIOS 1155, 27

BIOS 983, 45

FIAT 764 — Immedialoliv GN 'F'

*p*-Nitrosophenol

or

*p*-Nitrophenol

or

*p*-Aminophenol

Heat *p*-nitrosophenol, *p*-nitrophenol or *p*-aminophenol with sodium sulfide and sulfur. Sulfurisation can be effected by —

(a) Boiling under reflux, or

(b) Baking at 290–300°C

Process (b) gives dyes of duller hues

Na₂S — solubility good — olive

53166 C.I. Sulphur Green 1 (*Dull green*)
C.I. Leuco Sulphur Green 1

Similar to the dyes under C.I.53165 but using copper salts in the melt

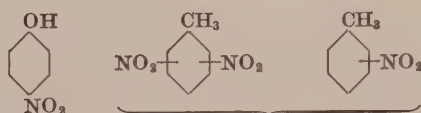
Discoverer — Lepetit 1895
 Lepetit, Dollfus & Gansser, *FP* 255473; *IP* LXXVIII, 356;
GP 101577 (*Fr.* 5, 455)
 Soc. Chem. Ind., Basle, *GP* 148024 (*Fr.* 7, 524)
BIOS-MISC. 55, Appendix 21
FIAT 764 — Immedialdunkelgruen B 'F'

53167 C.I. Solubilised Sulphur Green 1 (*Dull green*)

The thiosulfonic acid of C.I. 53166

Soluble in water

53170 C.I. Sulphur Green 21 (*Dull green* → *Greenish grey*)



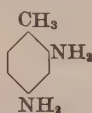
Residue from manufacture of
 dinitrotoluene

Heat these intermediates with sodium polysulfide

53175 C.I. Sulphur Green 8 (*Olive* → *Dull yellowish brown*)



p-Nitrophenol



Toluene-2,4-diamine

Sulfurise *p*-nitrophenol with aqueous sodium polysulfide in the presence of copper sulfate at 128–130° for 30 hours. Then add a solution of the sulfurisation product from toluene-2,4-diamine (represented by C.I.53050) and evaporate the mixture to dryness (*FIAT* 764)

p-Aminophenol may be used instead of *p*-nitrophenol

BIOS-MISC. 55, Appendix 13–1
FIAT 764 — Immedialoliv B 'F'

Na₂S — yellowish brown

H₂SO₄ conc. — olive brown; on dilution — olive brown ppt.

53180 C.I. Sulphur Black 3 (*Greenish black*)



p-Aminophenol

or



p-Phenylenediamine

Heat *p*-aminophenol (or *p*-aminophenol plus other compounds) with a large excess of sodium sulfide and sulfur at 180–210°C

Heat *p*-phenylenediamine with sodium sulfide and sulfur

Other aminophenol (or hydroquinone) type compounds, disclosed in the cited patents, give black dyes of somewhat similar properties

Discoverer — Vidal 1893

Vidal Black

Dyes cotton direct greyish-blue to bluish-black, converted by oxidation with dichromate into black

The first black sulfide dye

Vidal & S.A. St. Denis, *BP* 19880/93, 23578/93, 3612/95, 13093/96, 16449/96, 18489/96, 5690/97; *USP* 532484, 532503, 549036, 549082, 561276, 594105, 601363, 618152; *FP* 206405, 231118 and addn., 236405, 236406, 239714, 244585, 258978, 264384, 264510, 264511, 264512, 264867, 264900, 289244 and addn.; *GP* 84632, 85330, 88392, 90369, 91719, 91720, (*Fr.* 4, 1048, 1049, 1052, 1051, 1049, 1052), 98437, 99039, 103301, 107236, 107729, (*Fr.* 5, 459, 439, 440, 463, 462)

S.A. St. Denis, *JSDC*, 12 (1896), 91

Vidal, *Mon. Scien.* 11 (1897), II, 655

Rev. gén. Mat. col. 84 (1902)

Mon. Scien. 17 (1903), 113, 427; 19 (1905), 25

Rowe, *JSDC*, 33 (1917), 11, 12

Appearance — black lumps with a bronze reflex

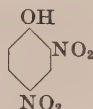
Water — bottle green

HCl — brown ppt.

NaOH — unaltered — the solution is decolorised by adding zinc dust

H₂SO₄ conc. — yellowish green

53185 C.I. Sulphur Black 1 (*Greenish → Bluish black*)
C.I. Leuco Sulphur Black 1



2,4-Dinitrophenol

Heat 2,4-dinitrophenol or its sodium salt (which may be prepared *in situ* by the alkaline hydrolysis of 1-chloro-2,4-dinitrobenzene) with sodium polysulfide under reflux at 110–120°C for 48–72 hours or for a shorter time under pressure at 130–140°C. Then dilute the melt and complete precipitation of the dye by the addition of acid or by air oxidation

It is necessary to have the correct ratio of intermediate to polysulfide in the melt. When this has been achieved, very little dye remains in solution at the end of the process.

The empirical formula has been stated to be $C_{24}H_{16}N_6O_8S_7$ or $C_{24}H_{16}N_6O_8S_8$ according to conditions used in the preparation of the dye (Vetter)

Discoverers — Vidal 1896

Priebs and Kaltwasser 1899 (condenser method)

Vidal, *BP* 16449/96, 141759; *USP* 618152; *FP* 231188 and addn. *GP* 98437 (*Fr.* 5, 459), 116354 (*Fr.* 6, 145)

Cassella Co., *BP* 19831/96; *FP* 259509, 267343

Stolaroff, *BP* 2195/00; *FP* 296180

Soc. Chem. Ind., Basle, *BP* 13035/03; *FP* 333096

Clayton Aniline, *BP* 17805/03

Kalle Co., *BP* 26379/03; *FP* 337278; *GP* 186860 (*Fr.* 8, 748)

Claus & Co., *BP* 11590/09

Bayer Co., *BP* 15625/09; *USP* 935009

Hiyama, *JSDC*, 67 (1951), 35, ab. from *JSCI Jap. (Ind. Chem.*

Sect.), 51 (1948), 92–98

Sunderland, *JSDC*, 17 (1901), 3

Mayenberg, *JSDC*, 17 (1901), 62

Erdmann, *Ann.* 362 (1908), 133

Vetter, *Dissertation, Dresden* (1910)

Vlies, *JSDC*, 29 (1913), 316

Rowe, *JSDC*, 33 (1917), 12

Lubs, 314–315

BIOS 983, 61

FIAT 764 — Immedialcarbon L

Immedialschwarz MO ex.

Immedialschwarz NGD

Immedialschwarz Paste N5G ex.

Immedialschwarz T ex.

PB 74181, fr. 2689 — Immedialcarbon B

Water — insoluble

Alcohol — insoluble

Na_2S — solubility very good — greenish black

$NaOH$ to sodium sulfide solution — rather bluer

HCl to sodium sulfide solution — greenish black ppt.

H_2SO_4 conc. — sparingly soluble cold, dull greenish blue hot,

converted into black blue by further heating

25% fuming sulfuric acid — black blue; on dilution — greenish black ppt.

53186 C.I. Solubilised Sulphur Black 1
(Greenish black → Bluish black)

The thiosulfonic acid of C.I. 53185

BIOS Misc. 55 — Immedial Carbon L for paper

FIAT 764 — Immedial Carbon L

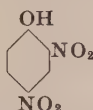
Soluble in water

H_2SO_4 conc. — black, with SO_2 evolved; on dilution — ppt.

$NaOH$ — bluish black

Na_2S soln. — greenish black

53190 C.I. Sulphur Black 10 (*Greenish black*)
C.I. Leuco Sulphur Black 10



2,4-Dinitrophenol



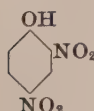
p-Aminophenol

Heat a mixture of 2,4-dinitrophenol and *p*-aminophenol (or *p*-nitrosophenol or *p*-nitrophenol) in aqueous sodium polysulfide

FDX 885 — Immedialtiefschwarz 3G

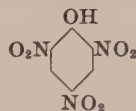
H_2SO_4 conc. — greenish black; on dilution — black ppt.

53195 C.I. Sulphur Black 2 (*Bluish black*)
C.I. Leuco Sulphur Black 2



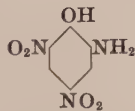
2,4-Dinitrophenol

and



Picric acid

or



Picramic acid

Heat a mixture of 2,4-dinitrophenol and picric or picramic acid with aqueous sodium polysulfide. See C.I. 53185 and C.I. 53205 to which this group of sulfur blacks is closely related

FIAT 764 — Immedialschwarz MORR ex. st.

Immedialschwarz RFL

FDX 885 — Immedialschwarz PFL

Na_2S — solubility very good — bluish black

H_2SO_4 conc. — bluish black; on dilution — black ppt.

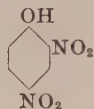
53196 C.I. Solubilised Sulphur Black 2 (*Bluish black*)

The thiosulfonic acid of C.I. 53195

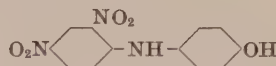
Soluble in water

53200 C.I. Sulphur Black 12 (Bluish black)

FIAT 764 — Immedialbrillantschwarz 5BV gruen
 Immedialbrillantschwarz G
 FDX 885 — Immedialschwarz 4B ex.



2,4-Dinitrophenol

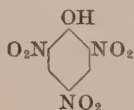
*p*-(2,4-Dinitroanilino)phenol

Heat a mixture of 2,4-dinitrophenol and *p*-(2,4-dinitroanilino)phenol in aqueous sodium polysulfide

Na₂S — solubility very good — bluish black

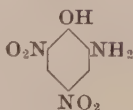
53205 C.I. Sulphur Black 5 (Reddish black)

Discoverer — Agfa 1900
 Agfa, BP 7332/00; GP 116791 (Fr. 6, 740)
 FDX 885 — Immedialschwarz FT ex.



Picric acid

or



Picramic acid

Heat picric or picramic acid or the sodium salt with aqueous sodium polysulfide to 110°C and reflux until a sample reaches dye test standard. Precipitate with air, if necessary, and filter

Na₂S — solubility very good — reddish black
 H₂SO₄ conc. — bluish black; on dilution — black ppt.

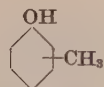
53206 C.I. Solubilised Sulphur Black 5 (Reddish black)

The thiosulfonic acid of C.I. 53205

Soluble in water

53210 C.I. Sulphur Brown 4 (Brownish olive → Yellowish brown)

Discoverer — Demuth 1895
 Bayer Co., GP 102897 (Fr. 5, 464)
 BIOS 1155, 5-6
 BIOS 983, 44
 FIAT 764 — Immedialschwarzbraun GN Rohschmelze
 FDX 885 — Immedialbraun BRS



crude Cresol

or

*m*-Cresol

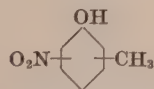
Bake crude cresol or *m*-cresol with sodium polysulfide at 270–275°C with or without the addition of copper sulfate

Appearance — brownish hygroscopic powder
 HCl — black brown ppt.
 NaOH — bluish green

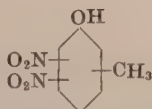
53211 C.I. Solubilised Sulphur Brown 4 (Brownish olive → Yellowish brown)

The thiosulfonic acid of C.I. 53210

Soluble in water

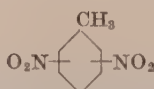
53215 C.I. Sulphur Brown 53 (Brown)

crude Nitrocresol



crude Dinitrocresol

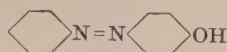
Bake a mixture of nitro and dinitrocresols (crude) with sodium sulfide and sulfur at 260–280°C

53218 C.I. Sulphur Brown 62 (Brownish olive → Yellowish brown)Catechol and other
bivalent phenolsResidue from manufacture
of dinitrotoluene

Heat these intermediates with sodium tetrasulfide

53220 C.I. Sulphur Green 18 (*Dull bluish green*)

Discoverer — Ajax Aniline Dye Mfg. Co., London

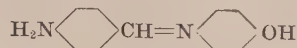
*p*-Phenylazophenol

Bake *p*-phenylazophenol with sulfur and sodium sulfide or sodium hydroxide, with or without the addition of copper sulfate, at 180–200°C, or at 250°C

Water — partially soluble
Na₂S — yellowish green.
NaOH — yellowish green

53225 C.I. Sulphur Yellow 8 (*Dull yellow*)

Discoverer — Soc. Chem. Ind., Basle 1900
Soc. Chem. Ind., Basle, *BP* 1007/00; *FP* 295712 and addn.;
GP 135335 (*Fr.* 6, 715)

*p*-(*p*-Aminobenzylideneamino)phenol

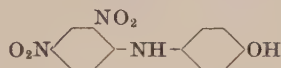
Bake *p*-(*p*-aminobenzylideneamino)phenol with sodium sulfide and sulfur, first at 100–120°C and then at 180–200°C. The corresponding nitro compound may also be used (*GP* 135335)

Na₂S — dull yellow**53228 C.I. Sulphur Red 10**Geigy, *BP* 753764*p*-Anilinophenol

Sulfurise *p*-anilinophenol in the presence of a water soluble organic solvent such as ethylene glycol, cyclohexanol or ethylene glycol monomethyl ether

53230 C.I. Sulphur Black 9 (*Bluish black*)

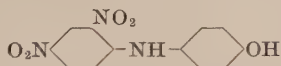
Discoverer — Kalischer 1897
Cassella Co., *BP* 25234/97, 4069/99; *USP* 610541, 678884;
FP 271909, 286287; *GP* 103861, 118087, (*Fr.* 5, 423, 943)
FIAT 764 — Immedialschwarz V ex. 'F'
Mayenbergh, *JSDC*, 17 (1901), 62

*p*-(2,4-Dinitroanilino)phenol

Add a suspension of *p*-(2,4-dinitroanilino)phenol in cold water to sodium polysulfide solution at 95°C. When reduction is complete heat under reflux at 114–115°C. Dilute with water, run in ferrous chloride solution and drum dry the mixture (*FIAT* 764)

Na₂S — bluish black**53235 C.I. Sulphur Blues 1, 3, 5, 11, 4** (*Navy → Reddish navy*)
C.I. Leuco Sulphur Blue 11

Discoverer — Bertschmann 1900
Soc. Chem. Ind. Basle, *BP* 5385/00; *USP* 665726; *FP* 298075
and addn.; *GP* 132424 (*Fr.* 6, 633)
Cassella Co., *BP* 9968/02; *FP* 350096; *GP* 137784 (*Fr.* 6, 636),
140963, (*Fr.* 7, 506)
BIOS 983, 45, 83–86
BIOS-MISC. 55, Appendices 22, 23, 24
FIAT 1313, 3, 229–230
FIAT 764 — Immedialdirektblau RL ex. 'F'
Immedialdirektblau 3RL ex.

*p*-(2,4-Dinitroanilino)phenol

The dyes in this group are prepared by the aqueous sulfuration of *p*-(2,4-dinitroanilino)phenol. The desired blue is obtained by varying the degree of purification and intensity of oxidation. Generally it is true to say that brightness is directly proportional to purification, whilst oxidation imparts a red tone to the finished product

(a) Add *p*-(2,4-dinitroanilino)phenol, as a 75% paste, over 2 hours at 90–92°C to sodium polysulfide and reflux at 106°C for 3 hours. Add sodium chloride, heat to 109–110°C and maintain at this temperature for 10 hours. Dilute with water and filter at 45°C. Dry at 70°C

Dyes of brighter hue are produced by air oxidation of the paste from the above process as follows —

(b) Dilute the paste from (a) with water, add caustic soda and oxidise with air for 5 hours. Salt out, filter and dry with the addition of sodium carbonate

(c) If the caustic soda addition is increased and air oxidation maintained for 14–16 hours a further increase in brightness results

(d) Air oxidise the press cake from (c) to which caustic soda has been added, for approx. 18 hours at 30°C. Salt out, filter and dry

(e) Still redder and brighter hues are produced by treatment of the above in a solution of the sodium salt of dithiodiacetic acid for 5 hours at 95°C. The dye is isolated and dried in the usual manner (*FIAT* 1313, 3, 229–230)

Some sulfur direct blues are manufactured by baking *p*-(2,4-dinitroanilino)phenol with aqueous sodium polysulfide at 135–140°C, followed by oxidation in the manner described above

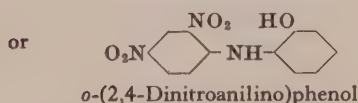
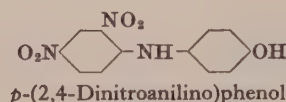
Alcoholic thionations are also known

Water — insoluble
Na₂S — solubility good — greenish blue
H₂SO₄ conc. — blue solution; on dilution — dark blue ppt.

53236 C.I. Solubilised Sulphur Blues 1, 5, 11, 4
(Navy → Reddish navy)
The thiosulfonic acid of C.I. 53235

Soluble in water
 H_2SO_4 conc.—dull reddish blue; on dilution — ppt.
 NaOH — blue; Na_2S soln.—dull blue or olive

53245 C.I. Sulphur Brown 5 (Dull brown)



(1) Heat *p*-(2,4-dinitroanilino)phenol with caustic soda and water to 105°C and then add dextrose, sodium sulfide, sulfur and a small quantity of copper sulfate. Boil for a short time, raise the temperature to 260–270°C during 20 hours, and bake for 6 hours

(2) Modification of (1)

After boiling with caustic soda solution precipitate the resultant degradation product with acid and filter. Add the paste so obtained to the polysulfide solution as above

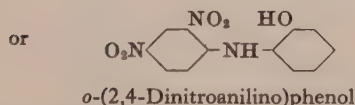
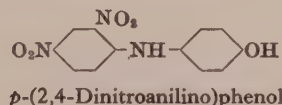
Similar dyes are obtained by omitting dextrose from the melt

A further variation in the above process is the use of *o*-(2,4-dinitroanilino)phenol (from *o*-aminophenol and 1-chloro-2,4-dinitrobenzene) in place of the *p*-(2,4-dinitroanilino)phenol

Discoverers — Hoffmann and Kalischer 1899
Cassella Co., BP 25754/99; USP 660058; FP 295593; GP 112484
(Fr. 6, 695)
BIOS 1155, 16
FIAT 764 — Immedialdunkelbraun A 'F'
Vlies, JSDC, 29 (1913), 319

Water — partially soluble
 Na_2S — solubility moderate — reddish brown
 H_2SO_4 conc. — dark brown

53246 C.I. Sulphur Brown 14 (Dull brown)
C.I. Leuco Sulphur Brown 14



Heat *o*- or *p*-(2,4-dinitroanilino)phenol in a similar manner to that outlined in C.I.53245 without the use of copper salts in the melt. Sulfurisation temperatures may vary from 123°C (under reflux) to 160°C (bake)

BIOS 1155, 44
FIAT 764 — Immedialschwarzbraun V ex. 'F'
FDX 885 — Immedialbraun B
For further literature references and reactions see C.I.53245

53247 C.I. Solubilised Sulphur Brown 5 (Dull brown)

The thiosulfonic acid of C.I. 53245

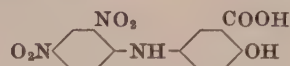
Soluble in water

53248 C.I. Solubilised Sulphur Brown 14 (Dull brown)

The thiosulfonic acid of C.I. 53246

Soluble in water

53255 Sulphur Dye (Black)



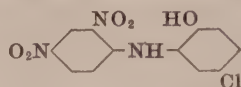
5-(2,4-Dinitroanilino)salicylic acid

Heat 5-(2,4-dinitroanilino)salicylic acid with sodium sulfide and sulfur to 150°C and maintain the temperature until the mixture is dry

Discoverers — Elbel and Rosenberg 1899
Sulfanil Black G (K)
Kalle Co., BP 5581/99; USP 667689; FP 286813; GP 129885
(Fr. 6, 647)

Water — green
 HCl — greyish black ppt.
 NaOH — unaltered
 H_2SO_4 conc. — sparingly soluble; dull, greenish blue

53260 C.I. Sulphur Red 2 (Dull bordeaux)

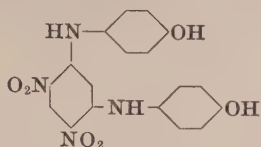


4-Chloro-2-(2,4-dinitroanilino)phenol

Add 4-chloro-2-(2,4-dinitroanilino)phenol during 90 minutes to sodium polysulfide at 45–70°C. Heat to boiling point, 104°C, and boil under reflux for 24 hours

Discoverer — Kaltwasser 1899
Agfa, GP 113515 (Fr. 6, 653)
BIOS 1155, 13
BIOS-MISC. 55, Appendix 14
FIAT 764 — Immedialkorin B ex. 'F'

Na_2S — deep bluish green
 H_2SO_4 conc. — brownish green; on dilution — violet black ppt.

53265 Sulphur Dye (Black)4,4'-(4,6-Dinitro-*m*-phenylenediimino)diphenol

Condense 1,5-dichloro-2,4-dinitrobenzene (1 mol.) with *p*-aminophenol hydrochloride (2 mol.) and bake the isolated reaction product with sodium polysulfide at 140°C

Related dyes of greener hues are obtained by using 4-amino-1-phenol-2-sulfonic acid or 5-aminosalicylic acid for the condensation in place of *p*-aminophenol (GP 112298)

Discoverer — Julius 1899

Kryogene Black BO (B)

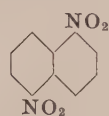
Badische Co., BP 20232/99, 5040/00, 6546/01, 25650/01; USP 648753, 648754, 648755, 688646, 695835; FP 293138 and addn.; GP 112298, 114270, 127441, 137108, (Fr. 6, 663, 664, 666, 668)

Water — bluish green

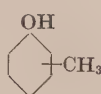
HCl — brown ppt.

NaOH — blue

H₂SO₄ conc. — sparingly soluble; yellowish green

(4) — SUBSTITUTED NAPHTHALENES (Other than Indophenols)**53270 C.I. Sulphur Brown 15 (Dull brown)****C.I. Leuco Sulphur Brown 15**

1,5-Dinitronaphthalene



crude Cresol

Bake a mixture of 138 parts of 1,5-dinitronaphthalene and 75 parts of crude cresol with sodium polysulfide, in the presence of copper sulfate and sodium chloride at 265°C for 12–14 hours. The 1,5-dinitronaphthalene may be reduced at 95°C with sodium polysulfide before baking (BIOS 1155, 12)

BIOS 1155, 12

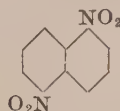
BIOS-MISC. 55, Appendix 15

FIAT 764 — Immedialbraun BR ex. 'F'

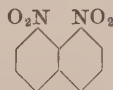
53271 C.I. Solubilised Sulphur Brown 15 (Dull brown)

The thiosulfonic acid of C.I. 53270

Soluble in water

53272 C.I. Sulphur Brown 63

1,5-Dinitronaphthalene



1,8-Dinitronaphthalene

Heat these intermediates with sodium polysulfide

53275 C.I. Sulphur Brown 7 (Dull reddish brown)

1,8-Dinitronaphthalene

Reduce 1,8-dinitronaphthalene with aqueous sodium sulfide at 90°C and bake with sodium polysulfide in the presence of copper sulfate and sodium chloride, raising the temperature gradually to 270°C (BIOS 1155, 6)

Discoverer — Isler 1897–1901

Badische Co., BP 9338/98; USP 632170; FP 277530; GP 92472, 92538, (Fr. 4, 352, 353), 103987, (Fr. 5, 453)

BIOS 983, 45

BIOS 1155, 6

FIAT 764 — Immedialschwarzbraun S ex. 'F'

Vlies, JSDC, 29 (1913), 319

Na₂S — reddish brown

NaOH — partially soluble; yellowish brown

H₂SO₄ conc. — dull red brown; on dilution — brown ppt.

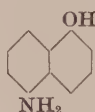
53280 C.I. Leuco Sulphur Brown 31 (Brown)

2-Naphthol

Bake the sodium salt of 2-naphthol with sodium polysulfide at 270–280°C. This forms the basis for the solubilised dye (BIOS 1155, 13)

BIOS 1155, 13

FIAT 764 — Immedialbraun T

53285 C.I. Sulphur Brown 16 (*Dull brown*)

5-Amino-1-naphthol

Bake the sodium salt of 5-amino-1-naphthol with sodium polysulfide at 180–215°C, during 43–45 hours. Then dissolve the crude product in water and precipitate the dye with acid (BIOS 983, 87–88)

BIOS 983, 44, 46, 87–88

BIOS-MISC. 55, Appendices 16, 18

FIAT 764 — Immedialechtsdunkelbraun B ex. 'F'

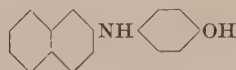
53286 C.I. Solubilised Sulphur Brown 16 (*Dull brown*)

The thiosulfonic acid of C.I. 53285

Soluble in water

53290 C.I. Sulphur Black 11 (*Bluish black*)

C.I. Leuco Sulphur Black 11

*p*-2-Naphthylaminophenol

Phenol



4,4'-Iminodiphenol

Heat *p*-2-naphthylaminophenol, with or without small amounts of phenol and 4,4'-iminodiphenol, in a solution of sodium polysulfide in butanol, under reflux for 30 hours at 108°C. Then oxidise *in situ* with sodium nitrite and remove the butanol by steam distillation. Isolate the crude dye by filtration and convert to the final product by treatment with dilute hydrochloric acid

Dyeings of this dye on cellulosic fibres are distinguished from those obtained with sulfur blacks from 2,4-dinitrophenol (C.I.53185 and related dyes) by their superior fastness to chlorine

Note — The addition of 4,4'-iminodiphenol is to prevent the finished product giving a brownish hue which otherwise readily takes place. It can, however, be omitted (BIOS 983, 117–129)

Discoverer — Heimann 1912

Agfa, USP 1105515

For structures proposed for these dyes see —

Valpiana, *thesis*, Eidg. Tech. Hochschule, Zurich (1946)Zerweck, Ritter & Schubert, *Z. angew. Chem.*, **60A** (1948), 141

BIOS 983, 59, 117–129

FIAT 764 — Indocarbon CL kz.

NaOH — grey; on dilution — black ppt.

H₂SO₄ conc. — blue; on dilution — black ppt.

53291 C.I. Solubilised Sulphur Black 11

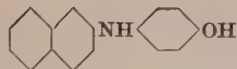
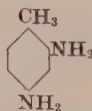
The thiosulfonic acid of C.I. 53290

53295 C.I. Sulphur Black 6 (*Bluish black*)

C.I. Leuco Sulphur Black 6

BIOS 983, 59–60, 130–138

FIAT 764 — Indocarbon CLG kz. 'F'

*p*-2-Naphthylaminophenol*p*-Nitrophenol

Toluene-2,4-diamine

Heat *p*-2-naphthylaminophenol together with small quantities of *p*-nitrophenol and toluene-2,4-diamine with a solution of sodium polysulfide in butanol under reflux for 30 hours at 111–112°C. Finally oxidise with sodium nitrite as in C.I.53290 (BIOS 983, 130–138)

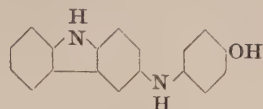
Has better fastness to chlorine than most sulfur dyes

53300 C.I. Sulphur Black 7 (Bluish black)

BIOS 983, 60, 139-148
BIOS-MISC. 55, Appendix 27
FIAT 764 — Brilliantindocarbon CLB



p-2-Naphthylaminophenol



p-(3-Carbazolylamino)phenol



p-Nitrophenol

Heat *p*-2-naphthylaminophenol together with small quantities of *p*-(3-carbazolylamino)phenol and *p*-nitrophenol, (in the proportions 8:1:1 respectively), in a solution of sodium polysulfide in butanol under reflux for 24 hours at 111-114°C. Finally oxidise with sodium nitrite as in C.I.53290 (BIOS 983, 139-148)

53301 C.I. Solubilised Sulphur Black 7

The thiosulfonic acid of C.I.53300

(5) — POLYCYCLIC COMPOUNDS

53320 C.I. Sulphur Brown 52 (Brown)

Discoverers — Hagge and Haagen 1935
I.G., BP 468416; GP 653675 (Fr. 24, 620)
FIAT 1313, 3, 248
FIAT 764 — Immedialkatechu 4RL 'F'



Decacyclene

Bake a mixture of decacyclene and sulfur at temperatures up to 350°C during 20 hours and maintain at this temperature for a further 8 hours. Treat the product in caustic soda at 100-110°C, filter and precipitate with sulfuric acid

Note — The sulfur dyes from decacyclene and its nitro derivatives (C.I.53325 and 53327) possess exceptionally good fastness to light

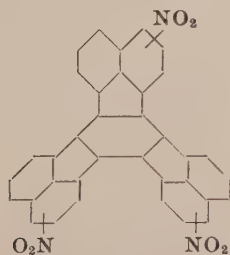
53321 C.I. Solubilised Sulphur Brown 52 (Brown)

The thiosulfonic acid of C.I. 53320

Soluble in water

53325 C.I. Sulphur Brown 60 (Brown)

Discoverers — Hagge and Haagen 1936
I.G., BP 468416; GP 655487 (Fr. 24, 621)
FIAT 1313, 3, 249
FIAT 764 — Immedialgelbbraun GL



Trinitrodecacyclene

Heat trinitrodecacyclene with sodium polysulfide under reflux for 24 hours at 114-116°C, and then bake at 240°C for 8 hours. Dissolve the crude product at 45°C in aqueous sodium sulfide, filter and then precipitate with sulfuric acid

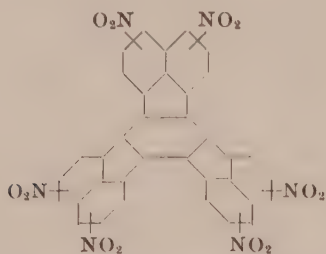
53326 C.I. Solubilised Sulphur Brown 60 (Brown)

The thiosulfonic acid of C.I. 53325

Soluble in water

53327 C.I. Sulphur Brown 51 (Brown)

Discoverers — Hagge and Haagen 1936
 I.G., BP 468416; GP 655487 (Fr. 24, 621)
 FIAT 764 — Immedialbraun GGL kz. 'F'



Hexanitrodecacyclene

Heat hexanitrodecacyclene with sodium polysulfide under reflux for 24 hours at 114–116°C, and then bake at 270°C for 5–6 hours. Dissolve in aqueous sodium sulfide and precipitate with sulfuric acid

53328 C.I. Solubilised Sulphur Brown 51 (Brown)

The thiosulfonic acid of C.I. 53327

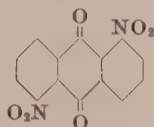
Soluble in water

53330 Sulphur Dye (Black)

Discoverer — Isler 1895

Anthraquinone Black (B)

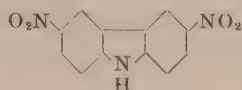
Badische Co., BP 15242/95, 14918/97; USP 597983; FP 249511;
 GP 91508 (Fr. 4, 291), 95484 (Fr. 5, 454)



1,5-Dinitroanthraquinone

Heat 1,5-dinitroanthraquinone, or the mixture obtained by the dinitration of anthraquinone, with sodium polysulfide

Water — bluish green
 Alcohol — sparingly soluble, green
 HCl to aqueous solution — ppt.
 NaOH — readily soluble
 H₂SO₄ conc. — greyish black; on dilution — greyish black ppt.

53335 C.I. Sulphur Brown 6 (Brown)

3,6-Dinitrocarbazole

Heat 3,6-dinitrocarbazole with sodium polysulfide in the presence of glycerol

Water — partially soluble
 HCl — reddish brown ppt.
 H₂SO₄ conc. — dark brown solution and ppt; on dilution — yellow brown ppt.
 NaOH — brown
 Na₂S — brown

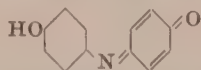
(6) — INDOPHENOLS**(a) Indophenols containing Two Benzene Nuclei****53400 C.I. Sulphur Blue 14 (Dull blue)**

Discoverer — Agfa

Fierz-David, 394

FIAT 764 — Immedialneublau G ex. 'F'

BIOS 1155, 21, 25–26

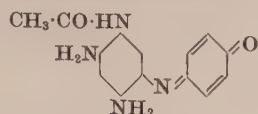


N-(p-Hydroxyphenyl)-p-quinone imine

Heat this intermediate with aqueous sodium polysulfide for 40–50 hours under reflux at 111–112°C. Precipitate by air blowing at 45°C or air oxidise in dilute caustic soda

The indophenol is made by oxidising a mixture of p-aminophenol and phenol with sodium hypochlorite

Na₂S — solubility good

53410 C.I. Sulphur Violet 1 (Violet)**C.I. Leuco Sulphur Violet 1**

N-(5-Acetamido-2,4-diaminophenyl)-*p*-quinone imine

Heat this intermediate with aqueous sodium polysulfide under reflux for 30 hours at 110°C. Then oxidise the isolated product in dilute caustic soda, precipitate with salt and finally improve its solubility by treatment with dilute hydrochloric acid and subsequent neutralisation with sodium carbonate

The indophenol is made by condensing 2,4-diaminoacetanilide with *p*-nitrosophenol (BIOS 983, 113–116)

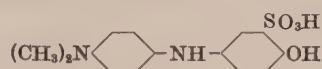
BIOS 983, 52, 113–116
FIAT 764 — Immedialviolett BBF

Na₂S — solubility good — reddish grey

53411 C.I. Solubilised Sulphur Violet 1 (Violet)

The thiosulfonic acid of C.I. 53410

Soluble in water
H₂SO₄ conc. — dull bluish red, with SO₂ evolved; on dilution — ppt.
NaOH — reddish blue
Na₂S soln. — dull reddish blue

53420 Sulphur Dye (Yellowish green)

4-(*p*-Dimethylaminoanilino)-1-phenol-2-sulfonic acid

Heat this intermediate with aqueous sodium polysulfide in the presence of copper sulfate under reflux at 125–130°C, then evaporate to dryness or precipitate by air blowing (USP 698555)

The indophenol is made by sulfonating *p*-(*p*-dimethylaminoanilino)-phenol with sodium sulfite (GP 129024)

Discoverer — Ris 1901

***Eclipse Green G conc. (Gy)**

Dyes cotton direct from a sodium sulfide and salt bath comparatively pure yellowish green, fast to washing and of moderate fastness to light

Geigy, BP 12578/01, 26448/01; USP 696751, 698555; FP 310809 and addn.; GP 129024, 129325, 135410, (Fr. 6, 103, 642, 643) Cassella Co., BP 7726/01; FP 313306; GP 129540 (Fr. 6, 641) Vlies, JSDC, 29 (1913), 318

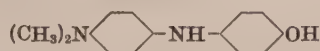
*This type of dye is now reported as being made by the method described under C.I.53570

Appearance — dark powder; the presence of copper can be detected readily in the ash

Water — dark violet

HCl — light brown ppt.

H₂SO₄ conc. — blackish brown; violet grey on keeping

53430 C.I. Sulphur Blue 9 (Bright blue)**C.I. Leuco Sulphur Blue 9**

p-(*p*-Dimethylaminoanilino)phenol

Heat this intermediate in alcoholic sodium polysulfide under reflux at 84°C for 165–170 hours. Then precipitate by air blowing and partial neutralization with hydrochloric acid

The indophenol is made by condensing *N,N*-dimethyl-*p*-phenylene-diamine with phenol

Aqueous sulfurisations are also known

Discoverers — Weinberg and Herz 1900

Cassella Co., BP 16247/00, 20741/01; USP 693632, 693633; FP 303524 and addn., 313306; GP 129540, 134947, 135952, 136188 (Fr. 6, 641, 636, 639, 638), 141752, (Fr. 7, 508)

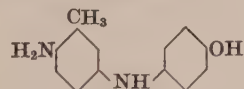
Soc. Chem. Ind., Basle, FP 308699

BIOS 1155, 6–9

FIAT 764 — Immedialbrillantblau CLB 'F'

Rowe, JSDC, 17 (1901), 120, 292

Na₂S — solubility moderate

53440 C.I. Sulphur Blue 7 (Reddish blue → Bluish violet)**C.I. Leuco Sulphur Blue 7**

p-(4-Amino-*m*-toluidino)phenol

Heat this intermediate with aqueous sodium polysulfide under reflux at 106–112°C for 50 hours. Then precipitate by air blowing at 75–80°C

The indophenol is made by condensing *o*-toluidine with *p*-nitrosophenol in sulfuric acid and then reducing with sodium tetrarsulfide

Redder and brighter dyeing products can be obtained by increasing the proportion of sulfur in the polysulfide and by using higher temperatures for sulfurisation

Alcoholic sulfurisations are also known

Discoverer — Herz 1902

Cassella Co., BP 58/02; USP 709151; FP 317219; GP 199963 (Fr. 9, 463)

Soc. Chem. Ind., Basle, BP 7025/03; USP 727387; FP 330388; GP ap. G18017 (Fr. 7, 332)

BIOS 983, 49, 98–100

BIOS 986, 1, 32–36 (Intermediate)

FIAT 764 — Immedialindon RF, RR ex. 'F'

Frank, JSDC, 26 (1910), 278

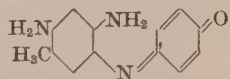
Na₂S — solubility good — greenish grey

H₂SO₄ conc. — bluish violet; on dilution — dark blue ppt.

53441 C.I. Solubilised Sulphur Blue 7
(Reddish blue → Bluish violet)
The thiosulfonic acid of C.I. 53440

Soluble in water, but limited
 H_2SO_4 conc. — dull violet with SO_2 evolved; on dilution — ppt.
 NaOH — blue; Na_2S soln. — dull blue or olive

53442 C.I. Sulphur Violet 5 (Violet)



N-(4,6-Diamino-*m*-tolyl)-*p*-quinone imine

Heat this intermediate, which is obtained by condensing toluene-2,4-diamine with *p*-nitrosophenol, with sodium polysulfide and sulfur

(b) Indophenols containing Three Benzene Nuclei

53450 C.I. Sulphur Blue 13 (Dull blue → Blue)

C.I. Leuco Sulphur Blue 13



N-(*p*-Anilinophenyl)-*p*-quinone imine

Heat this intermediate with aqueous sodium polysulfide at 122–124°C for 36 hours. After dilution, precipitate with air (BIOS 1155, 21–22)

The indophenol is made by condensing diphenylamine with *p*-nitrosophenol in sulfuric acid

Refluxing at 116–117°C gives dyes of slightly brighter hue

Alcoholic sulfurisations are also known

Discoverer — Herz 1902

Cassella Co., BP 16823/02; USP 723154; FP 323202; GP 150553
(Fr. 7, 507)

Du Pont, USP 1471854

BIOS 1155, 21–22

FIAT 764 — Immedialindon BBF ex. 'F'

Na_2S — solubility moderate — greenish yellow

H_2SO_4 conc. — greenish blue; on dilution — dark blue ppt.

53451 C.I. Sulphur Green 22 (Bluish green)

Prepared in a similar way to C.I. 53450 but in the presence of copper sulfate. Heat *N*-(*p*-anilinophenyl)-*p*-quinone imine with aqueous sodium polysulfide, in the presence of copper sulfate under reflux for 50 hours at 115°C; then precipitate by air blowing at 70°C

53452 C.I. Solubilised Sulphur Blue 13 (Blue)

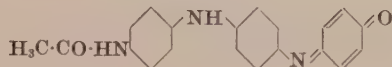
The thiosulfonic acid of C.I. 53450

Soluble in water

53460 C.I. Sulphur Blue 6 (Blue)

FIAT 1313, 3, 229–230

Greener than C.I. 53480 and superior in washing fastness and levelling properties



N-[*p*-(*p*-Acetamidoanilino)phenyl]-*p*-quinone imine

Heat this intermediate with aqueous sodium polysulfide

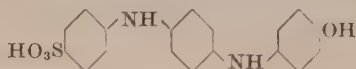
The indophenol is made by condensing *p*-anilinoacetanilide with *p*-nitrosophenol

53461 C.I. Solubilised Sulphur Blue 6

The thiosulfonic acid of C.I. 5460

53470 C.I. Sulphur Blue 10 (Blue)

C.I. Leuco Sulphur Blue 10



N-[*p*-(*p*-Hydroxyanilino)phenyl]sulfanilic acid

Heat this intermediate with aqueous sodium polysulfide under reflux at 105–106°C for 100 hours and then precipitate by air blowing and the addition of salt at 70–80°C

The indophenol is made by reducing the products formed by either condensing *N*-phenylsulfanilic acid with *p*-nitrosophenol or oxidising a mixture of *N*-phenylsulfanilic acid and *p*-aminophenol with manganese dioxide in hydrochloric acid

BIOS 983, 50, 102–105

BIOS 1155, 24

FIAT 1313, 3, 228

FIAT 764 — Immedialneublau BL ex. 'F', FBL ex. 'F'

Water (hot) — partially soluble

Na_2S — solubility good — almost colourless

H_2SO_4 conc. — bright blue; on dilution — blue ppt.

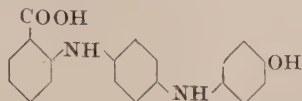
53471 C.I. Solubilised Sulphur Blue 10 (Blue)

The thiosulfonic acid of C.I. 53470

Soluble in water

53480 C.I. Sulphur Blue 2 (Blue)**C.I. Leuco Sulphur Blue 2***BIOS* 983, 50, 106–110*FIAT* 1313, 3, 228–230*FIAT* 764 — Immedialneublau 3GL ex. 'F'

Redder than C.I.53460 but inferior in washing fastness and levelling properties

*N*-[*p*-(*p*-Hydroxyanilino)phenyl]anthranilic acid

Heat this intermediate in aqueous sodium polysulfide under reflux at 105–106°C for 65 hours. Precipitate the crude dye from sodium sulfide solution by adding salt and oxidise with air in cold dilute caustic soda solution. Finally precipitate the finished dye by salt addition.

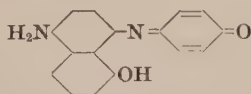
The indophenol is made by condensing *N*-phenylanthranilic acid with *p*-nitrosophenol and reducing the product with sodium hydrosulfide

53481 C.I. Solubilised Sulphur Blue 2 (Blue)

The thiosulfonic acid of C.I. 53480

Soluble in water

(c) Indophenols containing a Naphthalene Nucleus

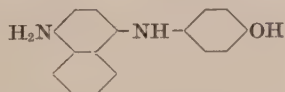
53520 C.I. Sulphur Black 8 (Grey)*BIOS* 1155, 16–17*FIAT* 764 — Immedialechtefeldgrau B 'F'*N*-(4-Amino-8-hydroxy-1-naphthyl)-*p*-quinone imine

Heat this intermediate with aqueous sodium polysulfide under reflux at 111°C for 50 hours and then precipitate the dye by air blowing (*BIOS* 1155, 17)

The indophenol is made by oxidising a mixture of 5-amino-1-naphthol and *p*-aminophenol with sodium hypochlorite

53530 C.I. Sulphur Green 6 (Dull bluish green)

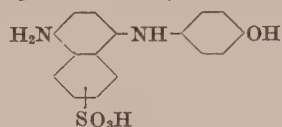
Discoverer — Gley 1903

Agfa, *USP* 741030*BIOS* 983, 91–92*FIAT* 764 — Immedialgruen G ex. 'F'*p*-(4-Amino-1-naphthylamino)phenol

Heat this intermediate with aqueous sodium polysulfide in the presence of copper sulfate, under reflux at 120°C for 30 hours, and then precipitate the dye by air blowing at 60°C

The indophenol is made by oxidising a mixture of 1-naphthylamine and *p*-aminophenol with sodium hypochlorite and then reducing with sodium hydrosulfide (*BIOS* 983, 91–92)

53531 C.I. Solubilised Green 6 (Dull bluish green)The thiosulfonic acid of C.I. 53530

53540 C.I. Sulphur Blue 15 (Greenish blue)

5(8)-Amino-8(5)-(p-hydroxyanilino)-2-naphthalenesulfonic acid

Heat this intermediate with aqueous sodium polysulfide under reflux at 107–108°C for 24 hours and after dissolving the partially precipitated dye in sodium sulfide re-precipitate by air blowing

The indophenol is made by oxidising a mixture of 5(8)-amino-2-naphthalenesulfonic acid (1,6 and 1,7 Cleve's acid) and *p*-aminophenol with sodium hypochlorite, and then reducing with sodium hydrosulfide

Similar results are obtained when 5-amino-8-(p-hydroxyanilino)-2-naphthalenesulfonic acid is sulfurised in the manner described

Discoverers — Levinstein and Naef 1903

USP 802049, 1733443

BIOS 983, 48, 94–97

BIOS 1155, 45

FIAT 764 — Immedialgruenblau CV, CV ex. 'F'
Immedialchromblau 5G ex. 'F'

Na₂S — solubility good — olive

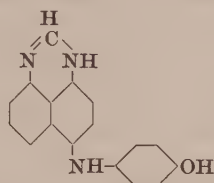
Water — partially soluble

H₂SO₄ conc. — dark blue; on dilution — dark blue ppt.

53541 C.I. Solubilised Sulphur Blue 15 (Greenish blue)

The thiosulfonic acid of C.I. 53540

Soluble in water

53550 C.I. Sulphur Green 5 (Dull bluish green)*p*-(6(or 7)-Perimidylamino)phenol

Heat this intermediate with an alcoholic solution of sodium polysulfide under reflux for 60 hours and after distilling off the ethanol heat at 102–103°C for a further 12 hours. Precipitate by air blowing

The indophenol is made by oxidising a mixture of perimidine and *p*-aminophenol with sodium hypochlorite, and then reducing with sodium sulfide

Discoverers — Scharfenberg and Herzberg 1911

Agfa, USP 1102171; GP 241909 (Fr. 10, 311)

For preparation of intermediate see GP 243545 (Fr. 10, 255)

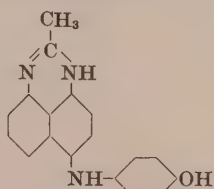
BIOS 1155, 17–18

FIAT 764 — Immedialgruen BT ex. 'F'

Na₂S₂O₄/NaOH — brownish yellow

Na₂S — greyish green

H₂SO₄ conc. — insoluble

53560 Sulphur Dye (Dull green)*p*-(2-Methyl-6(or 7)-perimidylamino)phenol

Heat this intermediate with an alcoholic solution of sodium polysulfide, in the presence of copper sulfate, for 120 hours and after distilling off the ethanol, precipitate by air blowing

The indophenol is made by oxidising a mixture of 2-methyl-perimidine and *p*-aminophenol with sodium hypochlorite

Discoverers — Scharfenberg and Herzberg 1911

Immedial Green MK extra (IG)

Fastness Properties (C): Acid 3, Acid boiling 3, Alkali 5,
Hot pressing 4–5, Light 6, Perspiration 4–5, Stoving 3,
Washing 4, Water 4–5 (boiling 3–4)

Agfa, USP 1102171; GP 241909 (Fr. 10, 311)

See also USP 1209580

BIOS 1155, 19–20

FIAT 764 — Immedialgruen MK ex. 'F'

53570 C.I. Sulphur Green 3 (Green)**C.I. Leuco Sulphur Green 3**

8-Anilino-5-(p-hydroxyanilino)-1-naphthalenesulfonic acid

Heat this intermediate with aqueous sodium polysulfide in the presence of copper sulfate under reflux at 106°C for 24 hours and then precipitate the dye by air blowing at 60–80°C

The indophenol is made by oxidising a mixture of Phenyl Peri acid and *p*-aminophenol with sodium hypochlorite and then reducing with sodium hydrosulfide

An increase in the quantity of copper sulfate in the melt shifts the hue of the dye formed towards yellowish green, whilst a decrease produces a trend towards bluish green

Discoverer — Böniger 1904

Sandoz, BP 11863/04, 222624; USP 776885, 1568622; FP 343377,
350083; GP 162156 (Fr. 8, 767)

BIOS 986, 2, 311

BIOS 983, 44, 48, 93

BIOS 1155, 10

FIAT 764 — Immedialgruen GG ex. 'F'

Water — partially soluble

Na₂S — solubility good — olive

H₂SO₄ conc. — dark blue; on dilution — dark blue ppt.

53571 C.I. Sulphur Green 2 (*Bluish green* → *Green*)

C.I. Leuco Sulphur Green 2

BIOS 986, 2, 311

BIOS 983, 47, 90

FIAT 764 — Immedialgruen BB ex. 'F'

Prepare in a similar manner to that described in C.I.53570 omitting the copper sulfate from the sulfuration

Na₂S — solubility good — olive

H₂SO₄ conc. — dark blue; on dilution — dark blue ppt.

53572 C.I. Solubilised Sulphur Green 2

(*Bluish green* → *Green*)

The thiosulfonic acid of C.I. 53571

Soluble in water

H₂SO₄ conc. — blue; on dilution — ppt.

NaOH — bluish black

Na₂S soln. — greenish blue

53573 C.I. Solubilised Sulphur Green 3 (*Green*)

The thiosulfonic acid of C.I. 53570

Soluble in water

H₂SO₄ conc. — dull green; on dilution — ppt.

NaOH — bluish green

Na₂S soln. — bluish green

53580 C.I. Sulphur Green 7 (*Green*)

C.I. Leuco Sulphur Green 7

BIOS 1155, 11–12

FIAT 764 — Immedialbrillantgruen 5G 'F'

See also C.I.53570

Yellower than C.I.53570, similar in fastness



5-(*p*-Hydroxyanilino)-8-*p*-toluidino-1-naphthalenesulfonic acid

Heat this intermediate with an alcoholic solution of sodium polysulfide in the presence of copper sulfate, under reflux for 50 hours. Then add sodium nitrite and after boiling for a further 16 hours, distil off the ethanol and precipitate by air blowing at 50–60°C

The indophenol is made by oxidising a mixture of *p*-Tolyl Peri acid and *p*-aminophenol with sodium hypochlorite, and then reducing with sodium hydrosulfide (BIOS 1155, 11–12)

53581 C.I. Solubilised Sulphur Green 7

The thiosulfonic acid of C.I. 53580

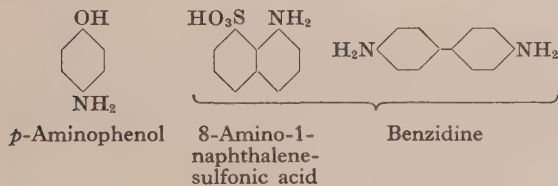
53590 C.I. Sulphur Green 10 (*Dull green*)

Thiogene Fast Green 3GW (FH)

Discoverer — Hahnenkamm 1912

M.L.B., BP 6080/12; USP 1083489; GP 272843 (*Fr.* 11, 488)

See also BP 359254; GP 590873 (*Fr.* 20, 1056)



Heat the indophenol derived from *p*-aminophenol and the condensation product of benzidine and 8-amino-1-naphthalenesulfonic acid (Peri acid) with sodium polysulfide in the presence of copper sulfate

Addition of molybdic acid to the sulfuration gives a yellower dye (GP 590873)

(d) Indophenols containing a Carbazole Nucleus

53630 C.I. Vat Blue 43 (*Reddish blue* → *Reddish navy*)

C.I. Vat Blue 47 (*Reddish navy*)

Discoverers — Haas 1908; Herz 1909

Cassella Co., BP 2918/09, 18822/09, 489/11; USP 919572, 931598, 956348; FP 400022, 413716, 435537; GP 218371, 227323, 230119, 224590, 224591, 235264, (*Fr.* 10, 301, 258, 256, 303, 303, 305)

BP 884027

R. Wedekind & Co., GP 284888 (*Fr.* 12, 288)

Fierz-David, 396

Lubs, 327–328

BIOS 983, 43, 53–58, 71–74, 75–81

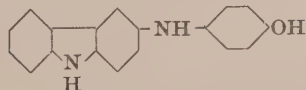
FIAT 1313, 3, 238

FIAT 764 — Hydronblau R, RR, 3R

For proposed constitution of these dyes see —

Shah, Tilak & Venkataraman, JSDC, 66 (1950), 333

Note — Some dyes of this constitution are converted into their leuco compounds in a similar manner to the C.I. Leuco Sulphur Dyes



p-(3-Carbazolylamino)phenol

Heat this intermediate with a solution of sodium polysulfide in butanol under reflux at 107°C for 24 hours. Then heat with sodium nitrite for a short time, distil off the butanol and complete precipitation of the dye by air blowing and adding salt

The indophenol is made by condensing carbazole with *p*-nitroso-phenol in conc. sulfuric acid at –20 to –23°C followed by reduction (BIOS 983, 71–74)

A modified dye is made by adding *p*-(4-amino-*m*-toluidino)phenol, 4,4'-iminodiphenol and phenol to the sulfuration (BIOS 983, 75–81)

H₂SO₄ conc. — dark blue; on dilution — blue ppt.

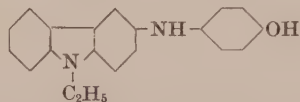
53631 C.I. Sulphur Black 4 (Bluish black)

Similar to the method described in C.I.53630 except that copper sulfate is added to the sulfurisation

Discoverer — Haas 1908

Cassella Co., BP 14143/09; FP 413755; GP 221215 (Fr. 10, 304)

FIAT 764 — Indocarbon SN

53640 C.I. Vat Blue 42 (Blue → Reddish navy)

p-(9-Ethyl-3-carbazolylamino)phenol

Heat this intermediate with sodium polysulfide in butanol in a similar manner to that described in C.I.53630

The indophenol is made by condensing 9-ethylcarbazole with *p*-nitrosophenol in conc. sulfuric acid at -23°C (BIO S 983, 65-70)

Discoverer — Herz 1909

Cassella Co., BP 9689/09, 489/11; USP 966092; FP 412012, 435537; GP 222640 (Fr. 10, 302)

BIO S 983, 65-70

FIAT 1313, 3, 238

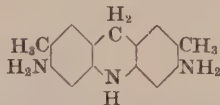
FIAT 764 — Hydronblau G

Greener than C.I.53630

Note — Some dyes of this constitution are converted into their leuco compounds in a similar manner to the C.I. Leuco Sulphur Dyes

H_2SO_4 conc. — greenish blue; on dilution — greenish blue ppt
 $\text{Na}_2\text{S}_2\text{O}_4/\text{NaOH}$ — yellow

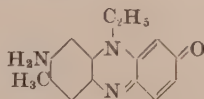
(7) — ACRIDINE, AZINE, OXAZONE and THIAZONE COMPOUNDS

53680 C.I. Sulphur Brown 20 (Brown)

3,6-Diamino-2,7-dimethylacridan

Bake this intermediate with sodium polysulfide at $280-285^{\circ}\text{C}$ for 24 hours

FIAT 764 — Immedialbraun R ex. kz. 'F'

53700 C.I. Sulphur Violet 4 (Reddish violet)

8-Amino-10-ethyl-7-methyl-2(10H)-phenazinone

Bake this intermediate with sodium polysulfide, in the presence of copper sulfate, at 190°C for 15 hours

The azine is made by condensing *N*⁴-ethyltoluene-2,4-diamine with *p*-nitrosophenol in dilute hydrochloric acid, and then oxidising with manganese dioxide (BIO S 983, 111-112)

Addition of molybdic acid to the bake reddens the hue (GP 590873)

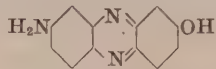
Discoverer — A. Schmidt 1905

M.L.B., BP 2797/06; USP 829740; FP 372277; GP 181125 (Fr. 8, 787)

I.G., GP 590873 (Fr. 20, 1056)

BIO S 983, 111-112

FIAT 764 — Immedialpurpur C 'F'

53710 C.I. Sulphur Red 3 (Dull bordeaux)

8-Amino-2-phenazinol

Heat this intermediate with aqueous sodium polysulfide, in the presence of copper sulfate, under reflux at $115-116^{\circ}\text{C}$ for 6 hours (BIO S 1155, 29)

The copper sulfate may be omitted from the process if desired

The azine is made by air oxidising *p*-(2,4-diaminoanilino)phenol

Discoverers — Weinberg 1900 (copper free dye)
 A. Schmidt 1905

Cassella Co., BP 14836/00; USP 701435; GP 126175 (Fr. 6, 680)

M.L.B., USP 818980; FP 361608; GP 171177 (Fr. 8, 783)

BIO S 983, 50

BIO S 1155, 23-24, 29

FIAT 764 — Immedialprune S ex. 'F'

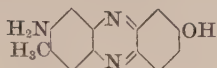
Immedialmarron B ex. 'F'

H_2SO_4 conc. — brownish violet; on dilution — red ppt.

53711 C.I. Solubilised Sulphur Red 3

The thiosulfonic acid of C.I. 53710

53720 C.I. Sulphur Red 6 (Bordeaux)
C.I. Leuco Sulphur Red 6



8-Amino-7-methyl-2-phenazinol

Heat this intermediate with aqueous sodium polysulfide under reflux at 115–116°C for 30 hours, then dilute and precipitate by air blowing and salt additions

The azine is made by oxidising the indophenol from toluene-2,4-diamine and *p*-aminophenol or *p*-nitrosophenol

Discoverer — Lehmann 1907
Bayer Co., BP 19548/07; USP 866939; FP 382412; GP 208109 (Fr. 9, 460)
BIOS 983, 51
BIOS 1155, 29–30
FIAT 1313, 2, 308
FIAT 764 — Immedialrotbraun 3B ex. 'F'

Water — partially soluble
H₂SO₄ conc. — dull bluish violet; on dilution — brown ppt.
Na₂S — solubility good — reddish brown → brown

53721 C.I. Sulphur Red 1 (Dull red)
C.I. Leuco Sulphur Red 1
C.I. Sulphur Brown 12 (Reddish brown)
C.I. Leuco Sulphur Brown 12

Similar to the method described in C.I.53720, except that copper sulfate is added to the sulfurisation

Dyes with hues varying from dull red to reddish brown may be obtained by reducing the proportion of copper sulfate in the sulfurisation according to the hue required

Discoverer — A. Schmidt 1905
M.L.B., USP 818980; FP 361608; GP 171177 (Fr. 8, 783)
FIAT 764 — Immedialbordo G 'F'
See also references in C.I.53720

Water — partially soluble
H₂SO₄ conc. — bluish violet; on dilution — brown ppt.
Na₂S — solubility good — reddish brown

53722 C.I. Sulphur Brown 56 (Dull reddish brown)

Bake 8-amino-7-methyl-2-phenazinol (see C.I.53720) with sodium polysulfide at 160°C for 48 hours

See references and reactions under C.I.53720 and C.I.53721

53723 C.I. Solubilised Sulphur Red 6 (Bordeaux)

The thiosulfonic acid of C.I. 53720

Soluble in water
H₂SO₄ conc. — dull reddish brown; on dilution — ppt.
NaOH — orange brown
Na₂S soln. — dull orange brown

53724 C.I. Solubilised Sulphur Brown 12 (Reddish brown)

The thiosulfonic acid of C.I. 53721

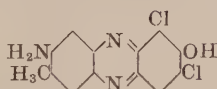
Soluble in water
H₂SO₄ conc. — brown with SO₂ evolved; on dilution — ppt.
NaOH — yellowish brown
Na₂S soln. — dull yellowish brown

53725 C.I. Solubilised Sulphur Brown 56 (Dull reddish brown)

The thiosulfonic acid of C.I. 53722

Soluble in water

53730 C.I. Sulphur Red 4 (Dull red)
C.I. Leuco Sulphur Red 4



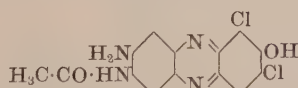
8-Amino-1,3-dichloro-7-methyl-2-phenazinol

Heat this intermediate with aqueous sodium polysulfide under reflux at 106°C for 22 hours in the presence of copper sulfate. Then dilute and drum dry

The azine is made by oxidising a mixture of toluene-2,4-diamine and 4-amino-2,6-dichlorophenol with manganese dioxide (BIOS 1155, 32–33)

BIOS 1155, 32–33
FIAT 764 — Immedialrotbraun 6R ex. kz. 'F'

53740 Sulphur Dye (Brown)



7-Acetamido-8-amino-1,3-dichloro-2-phenazinol

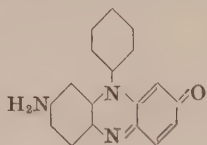
Heat this intermediate with aqueous sodium polysulfide under reflux at 105–107°C for 30 hours in the presence of copper sulfate

The azine is made by oxidising a mixture of 2,4-diaminoacetanilide and 4-amino-2,6-dichlorophenol with manganese dioxide

Immedial Cutch BF (IG)

Fastness Properties (C): Acid 4–5, Acid boiling 4; Alkali 5, Hot pressing 5, Light 4, Perspiration 4, Stoving 3, Washing 4–5, Water 5 (boiling 2–3)

BIOS 1155, 14–15
FIAT 764 — Immedialkatechu BF 'F'

53760 C.I. Sulphur Violet 2 (Violet)

8-Amino-10-phenyl-2(10H)-phenazinone

Bake this intermediate with sulfur, with or without copper sulfate
The azine is made by oxidising a mixture of 1 mol. of *p*-phenylenediamine and 2 mol. of aniline (BIOS 1155, 46)

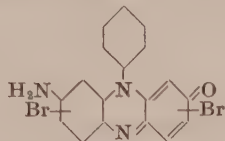
Discoverer — A. Schmidt 1904

M.L.B., BP 16269/04, 14543/05; USP 778713, 818980; FP 350088, 360437, 361608; GP 168516, 171177, 177493, 177709, 178982, 179021, 179960, 179961, (Fr. 8, 775, 783, 777, 785, 782, 786, 778, 779)

For use of molybdenum and other metal salts in the sulfuration see I.G., BP 359254; USP 1886365; GP 590873 (Fr. 20, 1056)

BIOS 1155, 46 (Intermediate)

H₂SO₄ conc. — dull reddish brown; on dilution — reddish brown ppt.

53770 Sulphur Dye (Dull reddish violet → Bordeaux)

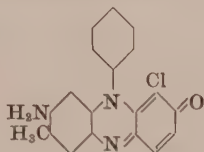
8-Aminodibromo-10-phenyl-2(10H)-phenazinone

Similar to the methods described in C.I.53760 using the dibrominated intermediate

Thiogene Violet BW (FH)

Fastness Properties (C): Acid 2-3, Alkali 4-5, Acid cross dyeing 4, Hot pressing 3-4, Light 3, Milling 3, Washing 4

See references under C.I.53760

53780 C.I. Sulphur Violet 3 (Reddish violet)**C.I. Leuco Sulphur Violet 3**

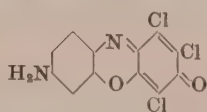
8-Amino-1-chloro-7-methyl-10-phenyl-2(10H)-phenazinone

Heat this intermediate with sodium polysulfide, in the presence of copper sulfate, under reflux at 114°C for 64 hours and then precipitate with salt

The azine is made by condensing *N*⁴-phenyltoluene-2,4-diamine with *p*-nitrosophenol and treating the product with sulfur chloride

BIOS 1155, 47-48 (Intermediate)

FIAT 764 — Immedialviolett 3R ex. 'F'

53800 C.I. Sulphur Blue 12 (Reddish blue)

7-Amino-1,2,4-trichloro-3H-isophenoxazin-3-one

Heat this intermediate with a solution of sodium polysulfide in alcohol under reflux for 24 hours at 80-81°C. After distilling off the alcohol, precipitate with salt and wash with brine

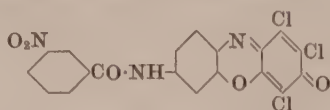
The oxazine is made by condensing chloranil with 2-amino-5-nitrophenol and then reducing at 30-40°C with aqueous sodium hydro-sulfite and caustic soda

Immedial New Blue 5R (CFM)

Discoverer — Zerweck 1932

I.G., PB 74234, fr. 4737-9, 4751, 4772-3, 4782-4
FIAT 1313, 3, 245

FIAT 764 — Immedialneublau 5R 'F'

53810 C.I. Sulphur Red 7 (Dull bluish red)1,2,4-Trichloro-7-(*m*-nitrobenzamido)-3H-isophenoxazin-3-one

Heat this intermediate with aqueous sodium polysulfide at 70-100°C for 30 hours and then precipitate with salt

The oxazine is made by reacting 7-amino-1,2,4-trichloro-3H-isophenoxazin-3-one (intermediate for C.I.53800) with *m*-nitrobenzoyl chloride

Discoverer — Hechtenberg 1933

I.G., PB 74234, fr. 4725, 4738, 4773
FIAT 1313, 3, 245

FIAT 764 — Immedialbordo 3BL

53811 C.I. Solubilised Sulphur Red 7

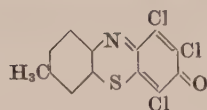
The thiosulfonic acid of C.I. 53810

53830 C.I. Sulphur Red 5 (*Bordeaux*)
C.I. Solubilised Sulphur Red 5

BIOS 1155, 31

FIAT 1313, 3, 243

FIAT 764 — Immedialrotbraun CL3R, CL3R 'F'



1,2,4-Trichloro-7-methyl-3*H*-isophenothiazin-3-one

Heat this intermediate with aqueous sodium polysulfide in the presence of glycerol under reflux at 75–98°C for 7 hours and to complete sulfuration add sodium chloride and heat for a further 24 hours under reflux at 103–104°C


The thiazine is made by condensing chloranil with the zinc salt of 6-amino-*m*-toluenethiol in ethanol under reflux (*BIOS* 1155, 31)

A somewhat bluer dye is produced by a similar method from 1,2,4-trichloro-7-ethoxy-3*H*-isophenothiazin-3-one (*FIAT* 1313, 3, 243)

NOTES

NOTES

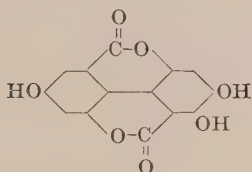
LACTONE COLOURING MATTERS

Of this class only four members are recorded, and they are prepared by oxidation or hydrolysis of polyhydroxy-aromatic compounds such as gallic acid or a dihydroxycoumarin. Their main application is on chrome-mordanted wool, to produce greenish to olive yellows. The chromophore is a lactone ring  and the auxochrome a hydroxyl group.

Literature

Perkin, A. G., and Everest, A. E., *The Natural Organic Colouring Matters*, London, 1918

55000 Mordant Dye



Oxidise α -resorcylic acid in sulfuric acid solution with ammonium persulfate or electrolytically; this treatment introduces the new hydroxyl group (Herzig & Tscherne, *Mhft.* **29**, 282)

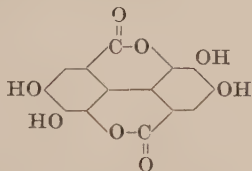
Discoverer — Bally 1895

Resoiflavine W (B)

Formerly used for fast yellows on chromed wool
Badische Co., *BP* 17660/95; *USP* 618000; *FP* 250422; *GP* 85390 (*Fr.* **4**, 360)
Herzig & Tscherne, *Mhft. Chem.* **25** (1904), 603; **29** (1908), 281; *Ann.* **351** (1907), 24
Herzig & Epstein, *Mhft. Chem.* **29** (1908), 671

Insoluble in water
Soluble in ethanol (yellow)
 H_2SO_4 conc. — yellow; on dilution — yellow ppt.
Aqueous solution + NaOH — yellowish red

55005 Mordant Dye



See also **C.I.75270** (Natural dye section)

Oxidise gallic acid with potassium persulfate in sulfuric-acetic acid solution

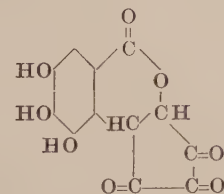
Discoverers — Chevreul (from oak galls) 1828
Löwe (from gallic acid) 1868

Alizarine Yellow (MLB)

Formerly used to a limited extent for producing a weak and dull sulfur yellow of excellent fastness on chromed wool
Chevreul, *Ann. Chim. Phys.* **9** (1828), 329
Löwe, *Z. Chem. Ind. Kolloide*, **4** (1868), 653; *Z. anal. Chem.* **14** (1876), 40
A. G. Perkin & Gunnel, *JCS*, **69** (1896), 1307
A. G. Perkin, *JCS*, **71** (1897), 1137; **77** (1900), 424; **89** (1906), 251
A. G. Perkin & Wilson, *JCS*, **83** (1903), 134
Graebe, *Ber.* **36** (1903), 214
A. G. Perkin & Nierenstein, *JCS*, **87** (1905), 1416
Nierenstein, *Ber.* **41** (1908), 3015; **42** (1909), 353
Sisley, *Bull. Soc. chim.* **5** (1909), 727

Almost insoluble in water
 H_2SO_4 conc. — reddish brown; on dilution — ppt. of the colour
Aqueous solution + NaOH — brownish yellow

55010 Mordant Dye



See also **C.I.75270** (Natural dye section)

Moderately oxidise gallic acid in aqueous alcoholic potassium hydroxide with air, and decompose the potassium salt formed with acids

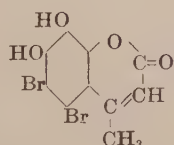
Discoverer — Bohn 1886

Galloflavine W (B)

Formerly used for olive yellows of good fastness on chromed wool, also in calico printing on a chromium mordant for greenish yellows which were rather sensitive to chlorine
Badische Co., *BP* 6413/86; *USP* 348613; *FP* 175835; *GP* 37934 (*Fr.* **1**, 567)
Knecht, *JSDC*, **2** (1886), 154
Bohn & Graebe, *Ber.* **20** (1887), 2327; *Dingl.* **263** (1887), 205
A. G. Perkin, *JCS*, **75** (1899), 442
Herzig & Tscherne, *Mhft. Chem.* **25** (1904), 603; **29** (1908), 281; *Ann.* **351** (1907), 24
Herzig, Erdös, & Ruzicka, *Mhft. Chem.* **31** (1910), 799
Herzig, *Ann.* **421** (1920), 257-258

Insoluble in water
Slightly soluble in boiling ethanol (pale yellow with green fluorescence)
 H_2SO_4 conc. — reddish yellow; on dilution — greyish white ppt.
Aqueous solution + NaOH — yellowish brown

55015 Mordant Dye



Dibrominate 4-methyldaphnetin (7,8-dihydroxy-4-methylcoumarin, made from pyrogallol and acetoacetic ester)

Discoverer — R. E. Schmidt 1889

Anthracene Yellow (By)

Dyes wool, on a chrome mordant or afterchrome, a greenish yellow of moderate fastness to light and milling. Was also used for dyeing silk and in Vigoureux printing
Bayer Co., *BP* 8411/90; *GP* 52927 (*Fr.* **2**, 486)
Wittenberg, *J. prakt. Chem.* **26** (1882), 68
von Pechmann & Duisberg, *Ber.* **16** (1883), 2127

Slightly soluble in water (yellow)
 H_2SO_4 conc. — pale brown; on dilution — white ppt.
Aqueous solution + NaOH — brownish yellow

NOTES

AMINOKETONE AND HYDROXYKETONE COLOURING MATTERS

These two groups of dyes have as chromophore the carbonyl group ($\text{C}=\text{O}$) and as auxochrome either an amino or substituted amino group or a hydroxyl group.

The aminoketone colouring matters are arylaminoquinones or amino-derivatives of naphthalimide and their substitution products. A number of these dyes, prepared by the condensation of chloranil or other halogenoquinones with amino compounds, followed in some cases by cyclisation, are applied to wool from a hydrosulfite vat.

The hydroxyketone dyes are hydroxyquinones or hydroxy-derivatives of aromatic ketones and include among their number some natural dyes such as Logwood (C.I. Mordant Black 11).

General

Lubs, *The Chemistry of Synthetic Dyes and Pigments*, New York, 1955

Hydroxyketones

Perkin, A. G., and Everest, A. E., *The Natural Organic Colouring Matters*, London, 1918

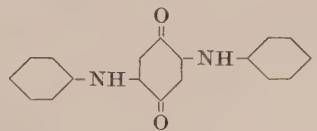
Dimroth and Ruch, *Ann.* **446** (1925), 123

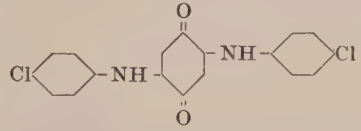
Mayer, F., *The Chemistry of Natural Coloring Matters*, 3rd Ed. Translated and Revised by A. H. Cook, New York, 1943

Venkataraman, *The Chemistry of Synthetic Dyes*, New York, 1952

References

ARYLAMINOQUINONES

| | | |
|---|--------------------------------|--|
| 56000 | Vat Dye (Dull yellowish brown) | <p>Discoverer — Lesser 1910</p> <p>Helindon Yellow CA, CAK (MLB)</p> <p>Vat dye for wool</p> <p>Fastness Properties (C): Light 4-5, 5, 5-6, Milling 5, Peroxide bleaching 5, Stoving 3, Washing 5</p> <p>M.L.B., GP 236074 (<i>Fr.</i> 10, 282)</p> <p>$\text{Na}_2\text{S}_2\text{O}_4$, alkaline — pale yellow; acid — colourless</p> |
|  | | |
| | | |
| Condense <i>p</i> -quinone with aniline | | |

| | | |
|--|--|--|
| 56005 | C.I. Vat Yellow 5 (Dull yellow → Dull brownish yellow) | <p>Discoverer — Lesser 1910</p> <p>M.L.B., GP 236074 (<i>Fr.</i> 10, 282)</p> <p>BIOS 1493, 6. FIAT 1313, 2, 198</p> <p>Venkataraman II, 796</p> <p>H_2SO_4 conc. — crimson; on dilution — yellowish brown ppt.</p> <p>$\text{Na}_2\text{S}_2\text{O}_4$ alkaline — yellow; acid — colourless</p> |
|  | | |
| | | |
| Condense <i>p</i> -chloroaniline with <i>p</i> -quinone in the presence of manganese acetate and oxidise with dichromate or with hydrogen peroxide | | |

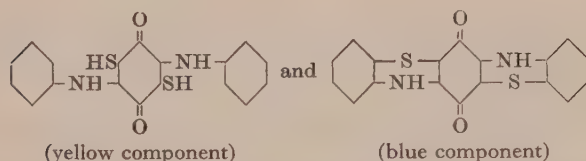
| | | |
|--|--|--|
| 56006 | C.I. Solubilised Vat Yellow 5 (Dull yellow → Dull brownish yellow) | <p>Discoverer and references —</p> <p>General — see C.I.59051A</p> <p>Additional —</p> <p>BIOS 1493, 72</p> <p>FIAT 764 — Anthrasolgelb HCG</p> <p>H_2SO_4 conc. — violet</p> |
| Leuco sulfuric ester of C.I.56005 | | |
| Prepare by general method — see C.I.59051A | | |

The following dyes C.I.56010-12 are prepared by the sulfuration of 2,5-dianilino-3,6-dichloro-*p*-quinone, and C.I.56015-17 by the sulfuration of 2,5-dichloro-3,6-bis(*p*-chloroanilino)-*p*-quinone. The sulfuration reagents include: sodium sulfide, sodium sulfide and sodium acetate, sodium hydrosulfide, sodium sulfide and sodium hydrosulfide, sodium thiosulfate, and sodium sulfide and ferric chloride. The conditions of temperature and pressure employed determine the resultant hues. In some cases almost identical results appear to be given from very different modes of preparation

| | | |
|-------|---|---|
| 56010 | C.I. Vat Brown 24 (Dull brownish olive) | <p>Discoverers — Lesser 1911; Maag 1911; Thiess 1913</p> <p>Lesser, <i>GP</i> 236074 (<i>Fr.</i> 10, 282)</p> <p>M.L.B., <i>BP</i> 9116/11, 9257/11, 8886/12, 19599/12, 22528/13, 3682/14, 19272/14, 213266, 240259; <i>USP</i> 1015329, 1025147, 1065063, 1128368, 1151628; <i>FP</i> 428111, 442565, 447592; <i>GP</i> 253091, 253761, 255642, 262180, 263382, 265195, 265196, 270401, (<i>Fr.</i> 11, 253, 254, 254, 252, 257, 257, 258, 258), 277059, 281353, 281520, 281521, 282501, 282502, 282503, (<i>Fr.</i> 12, 225, 230, 226, 227, 227, 228, 228), 461490 (<i>Fr.</i> 16, 1125)</p> <p><i>BIOS</i> 1493, 4</p> <p><i>FIAT</i> 764 — Helindonbraun CV</p> |
| | C.I. Vat Brown 34 (Brown) | |
| | Sulfurised | |
| | | |
| <hr/> | | |
| | Vat Brown 24 | Vat Brown 34 |
| | $\text{Na}_2\text{S}_2\text{O}_4$, alkaline — brownish olive | yellowish brown |
| | acid — pale yellow | pale yellow |

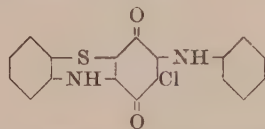
56011 C.I. Vat Green 23 (Olive)

Probably a mixture of



BIOS 1493, 6
FIAT 764 — Helindonkhaki C

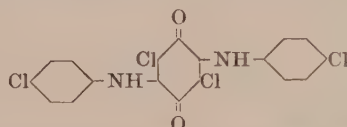
H₂SO₄ conc. — violet; on dilution — greenish brown ppt.
Na₂S₂O₄, alkaline — dull olive

56012 C.I. Vat Brown 37 (Brown)

H₂SO₄ conc. — brownish violet; on dilution — dark brown ppt.
Na₂S₂O₄, alkaline — yellowish brown; acid — colourless

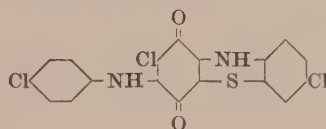
56015 C.I. Vat Green 22 (Olive → Brownish olive)

Sulfurised



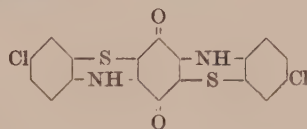
Discoverer — K. Thiess 1913
M.L.B., USP 1151628; GP 282501 (Fr. 12, 227)
FIAT 764 — Helindonkhaki CR
FDX 885

Na₂S₂O₄, alkaline — brownish olive; acid — pale yellow

56016 C.I. Vat Brown 21 (Brown)

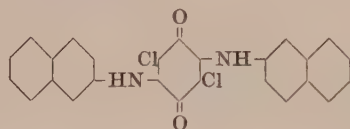
Discoverers — K. Thiess and F. Maennchen 1913
M.L.B., GP 282501 (Fr. 12, 227)
I.G., USP 1882263; GP 507833 (Fr. 17, 941)
FIAT 764 — Helindonbraun CRD

Na₂S₂O₄, alkaline — yellowish brown; acid — pale yellow

56017 Vat Dye

Antinolo Brown G (Acna)

Vat dye for wool
BIOS-MISC 20, 23

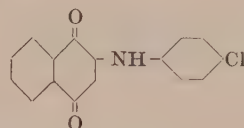
56045 Vat Dye (Brown)

Condense chloranil (1 mol.) with 2-naphthylamine (2 mol.)

Discoverer — Lesser 1910
Helindon Brown CR (MLB)

Vat dye for wool
Fastness Properties (C): Light 7, 7-8, 7-8, Milling 5,
Peroxide bleaching 4-5, Stoving 4-5, Washing 5
M.L.B., BP 14904/11; USP 1018433; GP 236074 (Fr. 10, 282),
262180 (Fr. 11, 252)

Na₂S₂O₄, alkaline — yellowish brown; acid — pale yellow

56050 C.I. Vat Red 33 (Dull bluish red)

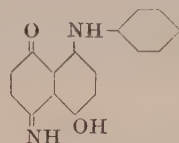
Condense *p*-chloroaniline with the bisulfite compound of 1-nitroso-2-naphthol, then oxidise with air

Discoverer — M.L.B. 1916
M.L.B., BP 9257/14; FP 428111; GP 236074 (Fr. 10, 282)
FIAT 764 — Helindonrot CR

Na₂S₂O₄, alkaline — reddish yellow; acid — pale yellow

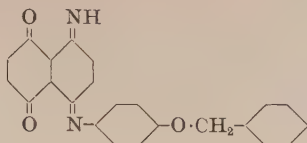
56055 C.I. Acid Black 47 (Bluish grey)

Sulfonated



Condense 8-amino-5-hydroxy-1,4-naphthoquinone imine with aniline and sulfonate

BIOS 987, 141
FDX 885
FIAT 764 — Saeurealizaringrau G
For preparation of the base see also Du Pont Co., USP 2135366

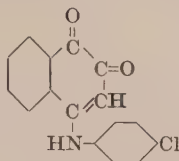
56060 C.I. Disperse Green 1 (Bluish green)

Discoverer — Robl 1937
 BIOS 1484, 60
 FIAT 1313, 2, 208
 FIAT 764 — Cellitonechtgruen 3B
 I.G., BP 493147; USP 2183870; GP 730536 (Fr.-Bayer, I-2, 207)

Condense the leuco form of 8-amino-5-hydroxy-1,4-naphthoquinone imine with *p*-benzyloxyaniline, then oxidise with air

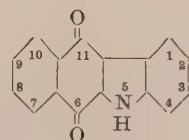
56065 C.I. Vat Red 30 (Bluish red)

Possibly



Condense 2-nitroso-1-naphthol-4-sulfonic acid with *p*-chloroaniline in presence of sulfuric acid, and oxidise the product

H₂SO₄ conc. — bluish red; on dilution — red ppt.
 Na₂S₂O₄, alkaline — dull bordeaux

56070 Vat Dye

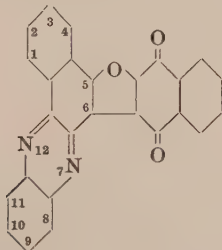
Couple benzo[*b*]carbazole (at position 6) with diazotised sulfanilic acid, add sodium bisulfite (to the azo bond), and treat with mineral acid (to generate the 6,11-dione)

Discoverers — Graebe and Knecht 1880; Bucherer 1926

Helindon Yellow R (IG)

Vat dye for wool

I.G., BP 317928; USP 1763216; GP 530745 (Fr. 17, 1084)
 Graebe & Knecht, *Ann.* **202** (1880), 13
 FDX 885 (PB 74762) — Helindongelb R

56075 Vat Dye (Yellow)

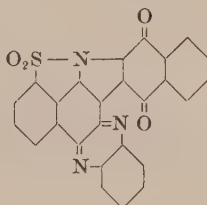
React benzo[*a*]phenazin-5-ol with 1,4-naphthoquinone

Discoverer — Agfa 1920

Helindon Brilliant Yellow G (IG)

Vat dye for wool

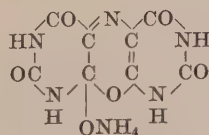
Agfa, GP 365902 (Fr. 14, 739)
 I.G., GP 433192, 435611, (Fr. 15, 437, 437)
 FDX 885 — Helindonbrillantgelb G

56080 C.I. Vat Yellow 27 (Bright greenish yellow)

Condense the 5-aminobenzo[*a*]phenazine-4-sulfonic acid sultam with 2,3-dichloro-1,4-naphthoquinone

Discoverer — Badische Co.

BIOS 987, 125
 FIAT 1313, 3, 35
 FIAT 764 — Indanthrengelb 6 GD
 Fox, JSDC, 65 (1949), 522

56085 Mordant Dye

(Piloty and Finckh)

(a) Heat alloxantin to 100° in an atmosphere of ammonia

(b) Evaporate uric acid with dilute nitric acid and treat the residue with ammonia

(c) Boil uramil with water, mercuric oxide, and ammonia

Discoverers — Scheele 1776; Prout 1818

Murexide, Rouge de Naples, Purpuric Acid

Formerly used in calico printing

Depouilly Frères, FP 24089
 Scheele, *Opusc.* **2**, 74
 Prout, *Ann. Chim. Phys.* **11**, 48
 Liebig & Wöhler, *Ann.* **26** (1883), 319
 Beilstein, *Ann.* **107** (1858), 176
 Piloty & Finckh, *Ann.* **333** (1904), 22; *J. prakt. Chem.* **73** (1906), 449

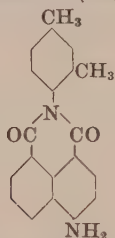
Slightly soluble in cold, very soluble in hot water (wine red)

Insoluble in ethanol

H₂SO₄ conc. — yellow; on dilution — colourless

AMINONAPHTHALIMIDES

56200 **C.I. Disperse Yellow 11** (*Bright greenish yellow*)
C.I. Solvent Yellow 44 (*Bright greenish yellow*)

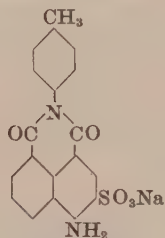


Condense 4-aminonaphthalic anhydride with 2,4-xylidine

Discoverers — Eckert and C. E. Müller 1928
 I.G., BP 304739; USP 1836529; GP 515029 (*Fr.* 17, 1511)
 FIAT 1313, 3, 79

H₂SO₄ conc. — brown ppt; on dilution — yellow solution with light brown ppt.

56205 **C.I. Acid Yellow 7** (*Bright greenish yellow*)

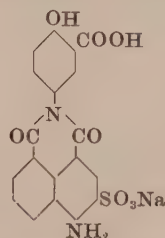


Condense 4-amino-3-sulfonaphthalic anhydride with *p*-toluidine

Discoverer — Eckert 1927
 I.G., BP 299721; USP 1796011; GP 494446 (*Fr.* 16, 850)
 FIAT 764 — Brillantsulfoflavin FF

Soluble in cold and hot water (yellow)
 Soluble in ethanol (yellow)
 H₂SO₄ conc. — yellow; on dilution — yellow
 Aqueous solution + NaOH — fades to pale yellow

56210 **C.I. Mordant Yellow 33** (*Greenish yellow*)

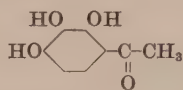


Condense 4-amino-3-sulfonaphthalic anhydride with 5-aminosalicylic acid

Discoverers — I.G. 1927; Durand and Huguenin 1931
 I.G., BP 299721; USP 1796011; GP 494446 (*Fr.* 16, 850)
 Durand & Huguenin, BP 384901; USP 1984110; GP 589566
 (*Fr.* 20, 1038)
 FIAT 1313, 2, 239
 FIAT 764 — Chromechtgelb 8GL

HYDROXYKETONES

57000 **Mordant Dye**



Condense pyrogallol with glacial acetic acid in presence of zinc chloride

Note — Fusion of the above dye in the presence of glycerol with the ammonium salts of selected aliphatic acids affords dyes of green hue (Prud'homme)

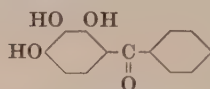
Discoverers — Nencki and Sieber 1881

Alizarin Yellow C (B)

Formerly used in calico printing on an aluminium mordant for greenish-yellows, fast to light and washing
 Badische Co., BP 8373/89, 9429/89; USP 443402, 452210;
 FP 198866; GP 50238 (*Fr.* 2, 484)
 Nencki & Sieber, *J. prakt. Chem.* 23 (1881), 147, 538
 Prud'homme, *Rev. gén. Mat. col.* 10 (1906), 225

Slightly soluble in cold, soluble in hot water (yellow)
 Soluble in ethanol (yellow)
 H₂SO₄ conc. — light yellow; on dilution — yellow ppt.
 Aqueous solution + NaOH — brown solution, darkened by air oxidation

57005 **Mordant Dye**



Condense pyrogallol with benzoic acid in presence of zinc chloride

Discoverer — Bohn 1889

Alizarin Yellow A (B)

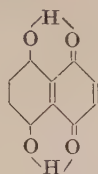
Formerly used in calico printing on an aluminium-calcium mordant for golden yellows fast to light and washing
 Badische Co., BP 8373/89; cf. 9427/89, 9428/89, 10095/90;
 USP 415088; FP 198281; GP 49149, 50450, 50451, 54661,
 (*Fr.* 2, 481, 485, 483, 485)
 Graebe & Eichengrün, *Ber.* 24 (1891), 967
 Eichengrün, *Ann.* 269 (1892), 295
 A. G. Perkin, *JCS*, 75 (1899), 442
 Prud'homme, *Rev. gén. Mat. col.* 10 (1906), 225

Soluble in boiling water (yellow)

H₂SO₄ conc. — yellow; on dilution — yellowish white ppt.
 Aqueous solution + NaOH — deep yellow, rapidly converted into a green product by air oxidation

57010 C.I. Mordant Black 37 (Grey → Reddish black)

Ammonium bisulfite compound of



React a mixture of 1,5- and 1,8-dinitronaphthalene, or either alone, with 40% oleum containing sulfur and convert the product (**Naphthazarine**) into the bisulfite compound

Note — Some brands represent the unsulfited compound

Soluble in water (reddish brown)

Soluble in ethanol (yellowish brown with green fluorescence)

H₂SO₄ conc. — dull yellowish green converted into carmine red on heating; on dilution — brownish with brownish black ppt.

Aqueous solution + NaOH — red turning to blue on air oxidation

Discoverers — Roussin 1861; Bohn 1887

Badische Co., *BP* 7833/87, 3828/94, 15709/98, 23887/00; *USP* 368054, 379150, 631614, 633950, 681613; *FP* 182962, 279782, 307554; *GP* 41518 (*Fr.* 1, 570), 76922, 79406, (*Fr.* 4, 344, 345), 101371, 101372, 108551, (*Fr.* 5, 317, 319, 318)

Bayer Co., *BP* 17673/92; *FP* 224739; *GP* 71386 (*Fr.* 3, 371), 77330 (*Fr.* 4, 346)

Oessinger Co., *FP* 250374; *GP* 84892 (*Fr.* 4, 47)

M.L.B., *BP* 16295/99; *FP* 291720; *GP* 111683 (*Fr.* 6, 444)

FIAT 764 — Alizarinschwarz S

Roussin, *Compt. rend.* 52 (1861), 1033, 1177; *J. prakt. Chem.* 84 (1861), 181

Friedländer & von Scherzer, *Mitt. Gew. Mus.* (1900), 11; cf. *JSCI*, 19 (1900), 339

Friedländer & Silberstein, *Mhft. Chem.* 23 (1902), 518

Walker, *JSDC*, 28 (1912), 16

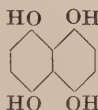
Knecht & Hibbert, *JSDC*, 31 (1951), 241

Dimroth & Ruck, *Ann.* 446 (1925), 123

Pfeiffer, Oberlin, & Segall, *Ber.* 60 (1926), 111

Fierz-David & Stockar, *Helv. Chim. Acta*, 26 (1943), 92

Venkataraman, 796-7

57011 Mordant Dye

React 1,5-dinitronaphthalene with 40% oleum containing sulfur, dilute the mixture with water, reduce at the boil with iron powder, filter, and allow the product to crystallise

Discoverer — Bohn 1900

Badische Co., *BP* 23887/00; *USP* 681613; *FP* 307554; *GP* 129074, 138092, (*Fr.* 6, 441, 443). Cf. *BP* 15708/98; *USP* 631614; *FP* 279782

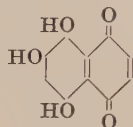
Wheeler & Edwards, *JACS*, 38 (1916), 387

Beilstein, *E I* 6, 573

Note — This leuco dye is said to have advantages over the dye of C.I.57010, since it can be applied directly to animal fibres (like an acid dye) where it is converted, by after-chroming, to a very strong black of excellent fastness properties (see *GP* 129074)

57015 Mordant Dye

Ammonium bisulfite compound of



Boil **C.I.57010** with more than 2 molecular proportions of aqueous sodium hydroxide and convert the product into the bisulfite compound

Discoverer — Bohn 1905

Naphthomelan SB (B)

Dyed afterchrome on wool yields a reddish black; dyed on chromed cotton yields a black faster than C.I.57010

Badische Co., *BP* 9547/05; *USP* 806053; *FP* 361447; *GP* 167641 (*Fr.* 8, 378), 293113 (*Fr.* 12, 284)

FDX 885 — Naphthomelan SB

Jaubert, *Compt. Rend.* 129 (1899), 681

Dimroth & Roos, *Ann.* 456 (1927), 177

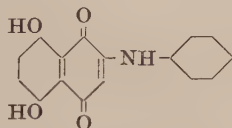
Soluble in water (orange red)

H₂SO₄ conc. — magenta red; on dilution — brown crystalline ppt.

Aqueous solution + NaOH — magenta red

57020 Mordant Dye

Bisulfite compound of



Condense **C.I.57010** with aniline in the presence of glacial acetic acid, and convert the product into the bisulfite compound

Discoverer — Bohn 1897

Alizarin Black SRA (B)

Dyed on chromed cotton yields a black faster than C.I.57010 — formerly used in calico printing

Badische Co., *BP* 21297/97; *USP* 631613; *FP* 270373; *GP* 101152, 101525 (*Fr.* 5, 327, 325)

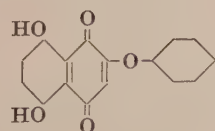
Ciba, *BP* 12790/13; *GP* 293113 (*Fr.* 12, 284)

FDX 885 — Alizarinschwarz SRA

Soluble in water (brown)

H₂SO₄ conc. — dull brown; on dilution — violet

Aqueous solution + NaOH — green converted into blue by air oxidation

57025 Mordant Dye

Condense **C.I.57010** with phenol

Discoverer — Bally 1897

Alizarin Dark Green W (B)

Dyes wool afterchrome or on a chrome mordant dark yellowish green, or aftertreated with chromium fluoride dark bluish green, fast to light and milling. Formerly used for shading and saddening

Badische Co., *BP* 10597/98; *USP* 619114, 619115; *FP* 277996; *GP* 103150 (*Fr.* 5, 323)

Ciba, *BP* 12790/13; *GP* 293113 (*Fr.* 12, 284)

FDX 885 — Alizarindunkelgruen W

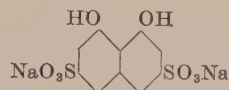
Soluble in water (violet)

Soluble in ethanol (violet blue)

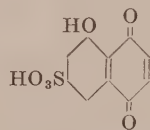
H₂SO₄ conc. — violet; on dilution — redder and dark ppt.

Aqueous solution + NaOH — greenish blue

57030 C.I. Mordant Brown 7 (*Reddish brown*)



On the fibre — Chromium salt of



Discoverer — Koch 1890

M.L.B., *BP* 9258/90; *GP* 56058 (*Fr.* 2, 260), 77552 (*Fr.* 4, 1065),

GP 67563 (*Fr.* 3, 460)

Badische Co., *GP* 147852 (*Fr.* 7, 131)

Bayer Co., *BP* 13443/90, 11522/92; *FP* 222119; *GP* 68721, 69190, (*Fr.* 3, 464, 465)

Cassella Co., *GP* 75153 (*Fr.* 3, 466)

(a) Alkaline fusion of 1-naphthol-3,6,8-trisulfonic acid

(b) React H acid with aqueous sodium hydroxide under pressure

(c) React 4,5-diamino-2,7-naphthalenedisulfonic acid with aqueous mineral acids under pressure

Soluble in water (pale brown)

H₂SO₄ conc. — colourless; on dilution — unaltered

Aqueous solution + FeCl₃ — grass green

NOTES

ANTHRAQUINONE AND RELATED COLOURING MATTERS

The characteristic chromophore of the anthraquinone and related colouring matters is the carbonyl group, and this may be present once or several times. Amino- and hydroxyl-groups and their substituted forms, NHR, NR₂, NHCOR, OR are frequently present and act as auxochromes.

In a number of instances, e.g. dibenzpyrenequinone, pyranthrone, and violanthrone, the parent carbonyl compound is coloured even in the absence of auxochromes.

The dyes in this group are distinguished by the wide variety of their molecular forms. As in other sections of Part II, they are arranged according to constitution, irrespective of individual methods of usage.

The dyes are divided into two main groups, their classification depending on whether or not they contain a heterocyclic nucleus *fused* to the main vatting system. Dyes containing nuclei and substituents of all kinds which are attached to the central vatting system by *single* bonds are regarded as derivatives of the corresponding unsubstituted compounds.

GROUP I

Dyes without a heterocyclic nucleus fused to a central vatting system

This group contains the simple quinones and their derivatives, i.e. anthraquinone, dibenzpyrenequinone, anthanthrone, pyranthrone, violanthrone, etc. arranged in order of increasing complexity. Included among the derivatives are heterocyclic compounds in which the hetero-nucleus is linked by *single* bonds to the central vatting system.

The progression of types is from simple to complex (e.g. anthraquinone before anthanthrone) and within each type, e.g. anthraquinone, the dyes are further subdivided into classes of increasing number of hydroxyl or amino groups.

Salts of sulfuric esters of reduced forms of dyes, i.e. the solubilised vat dyes, are listed immediately after the parent dyes, as are the *N*-alkyl, *N*-aryl and *N*-acyl derivatives of amines.

The nuclear positions are numbered in the first formula of each new series.

ANTHRAQUINONE-TYPE DYES NOT CONTAINING AMINO GROUPS

The hydroxyanthraquinones are listed first and appear in the order *di*-, *tri*-, *tetra*-, *penta*-, and *hexa*-hydroxyanthraquinone. Alkyl, halogen, nitro and sulfonated compounds follow the parent compounds, the sulfonic acids being placed first because of their special importance. Throughout the section compounds substituted in position 1 are listed before those substituted in position 2 and these, in turn, are succeeded by the 3-, 4-, 5-, 6-, 7- and 8-derivatives in that order.

The following examples will serve to illustrate the order of progression —

| | |
|-----------|--|
| C.I.58000 | 1,2-Dihydroxyanthraquinone |
| C.I.58005 | 1,2-Dihydroxy-3-anthraquinonesulfonic acid |
| C.I.58600 | Hexahydroxyanthraquinone |
| C.I.59100 | Dibenzpyrenequinone |
| C.I.59101 | Leuco sulfuric ester of C.I.59100 |
| C.I.59800 | Violanthrone |
| C.I.59825 | Dimethoxyviolanthrone |

ANTHRAQUINONE-TYPE DYES CONTAINING AMINO GROUPS

Mono-amino anthraquinones precede the *di*-amino-derivatives which, in turn, are followed by the *tri*-amino and *tetra*-amino compounds in that order.

Aminohydroxyanthraquinones appear as hydroxy derivatives of the appropriate aminoanthraquinones. Amongst *di*-amino compounds 1,2-diamino-derivatives precede 1,3-diamino-derivatives and these are followed by the 1,4-, 1,5-, 1,6-, 1,7-, 1,8-2,6- and finally 2,7-diamino-derivatives in that order.

The following examples will serve to illustrate the order of progression —

Anthraquinone dyes containing one amino group

| | |
|-----------|---------------------------------------|
| C.I.60500 | 1-Aminoanthraquinone |
| C.I.60505 | 1-Methylaminoanthraquinone |
| C.I.60515 | 1-Benzamidoanthraquinone |
| C.I.60710 | 1-Amino-4-hydroxyanthraquinone |
| C.I.60880 | 2-Amino-1,5,8-trihydroxyanthraquinone |

Anthraquinone dyes containing more than one amino group

| | |
|-----------|---------------------------------|
| C.I.61100 | 1,4-Diaminoanthraquinone |
| C.I.61725 | 1,5-Dibenzamidoanthraquinone |
| C.I.64015 | 1,4,5-Tribenzamidoanthraquinone |
| C.I.64500 | 1,4,5,8-Tetraaminoanthraquinone |

Miscellaneous dyes, including vat dyes derived from dibasic acids, complete the first group.

| | |
|-----------|---|
| C.I.65000 | 4,4'-Iminodi-1-anthraquinonesulfonic acid |
| C.I.65400 | <i>N,N'</i> -Di-1-anthraquinonylsuccinamide |

GROUP II

Dyes with a heterocyclic nucleus fused to a central vatting system

The dyes in this group contain at least one heterocyclic nucleus *fused to* a carbocyclic nucleus (usually anthraquinone or benzanthrone). They are arranged in order of increasing complexity.

The heterocyclic rings are listed in order according as they contain (a) one N member; (b) two N members; (c) one N and one S member; (d) three N members. Rings fused in the 1,2-positions are listed before 1,9- and 2,3-rings.

The following table summarises the arrangement of dyes in Group II —

| Carbocyclic nuclei | Fused Heterocyclic nuclei | Atoms in Heterocyclic nucleus | C.I. numbers of dyes in Section |
|--------------------|---------------------------|-------------------------------|---------------------------------|
| 1 | 1 | 5 | 66700–67110 |
| 1 | 2 | 5,5 | 67300–67301 |
| 1 | 1 | 6 | 67405–68615 |
| 1 | 2 | 6,6 | 68700–68705 |
| 2 | 1 | 5 | 69000–69400 |
| 2 | 1 | 6 | 69500–70100 |
| 2 | 2 | 5,5 | 70200–70405 |
| 2 | 2 | 5,6 | 70500–70510 |
| 2 | 2 | 6,6 | 70600–70700 |
| 3 | 2 | 5,5 | 70800–70810 |
| 3 | 3 | 5,5,6 | 70900–71000 |
| 5 | 4 | 5,5,5,5 | 71025–71050 |
| — | 2,3,4 | — | 71100–71145 |
| 2 | 1 | >6 | 71200–71210 |

General comment

Anthraquinone dyes are found in a wide variety of usage groups, including vat, acid, mordant, disperse, pigment, solvent, smoke and cosmetics.

The hydroxy compounds exist naturally and are typified by alizarin, the colouring matter of Madder used in the production of Turkey Reds. Alizarin was produced synthetically in 1869, and the discovery of its constitution led to the introduction of many hydroxyanthraquinone derivatives as commercial mordant dyes.

The arylaminoanthraquinones were discovered in 1894 and the sulfonation of these and other anthraquinone compounds gave rise to a range of bright acid dyes of good fastness to light.

The first of the anthraquinone vat dyes was indanthrone, discovered in 1901. As a class the vat dyes possess high fastness to light, washing and bleaching. Their reduced forms are deeply coloured, unlike the yellows characteristic of the indigoid dyes. A wide range of dyes followed the introduction of indanthrone but bright greens were missing from the range until 1920 when two methoxy groups introduced into violanthrone gave Caledon Jade Green. The next important development was the solubilizing of vat dyes through the sulfuric acid esters of the "leuco" forms. In use the original dye is reformed by the action of oxidants.

Some vat dyes, particularly yellows and oranges, show a tendency to accelerate the tendering of cellulose under the influence of light during and after the dyeing operation. The occurrence of tendering has been noted where applicable. For the chemical constitution of tendering vat dyes see Venkataraman, *Chemistry of Synthetic Dyes*, p. 1243.

Dyes for acetate rayon and superpolyamides are found among the simpler amino compounds, some as disperse dyes and others in a water-soluble form. Some of the less complex blue disperse dyes show a tendency to change colour on exposure to gas fumes for long periods, as during storage, but others are free from this tendency.

When natural dyes are also made synthetically appropriate cross references are given. Where they are not made synthetically a note is included in this section giving the Natural Dye section references.

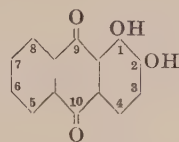
References

- Barnett, *Anthracene and Anthraquinone* (1921)
 Houben, *Das Anthracen und die Anthrachinone* (1929)
 Fierz-David, *Künstliche Organische Farbstoffe* (1926), Chap. XVIII
 Fierz-David and Blangey, *Dye Chemistry* (1949), Tables 16–21
 Kunz, Die Indanthrenfarbstoffe, *Z. angew. Chem.*, **52** (1939), 269
 Herzog, *Reactionstabelle der Küpfenfarbstoffe*, 2nd Edn. (1941)
 Gill and Stonehill, *Structure of Indanthrone, Indigo, etc.*, *JSDC*, **60** (1944), 183
 Thorpe, *Dictionary of Applied Chemistry*, 4th Edn., Vol. 1. See under Acetate Silk Dyes, Alizarin and Allied Dyes, Anthraquinone, Anthraquinone Dyestuffs
 Fox, Relationship between the Chemical Constitution of Vat Dyes and their Dyeing and Fastness Behaviour, *JSDC*, **65** (1949), 508
 Kunz, Fifty years of Indanthren, *Text-Rund.* **6** (1951), 533
 Venkataraman, *Chemistry of Synthetic Dyes* (1952), Vol. II, Chap. 27–32
 Holbro, Polycyclic aromatic hydrocarbons as starting materials for the synthesis of dyestuffs, *J. Appl. Chem.* **3** (1953), Pt. 1
 Coffey, Chemical Problems arising in the Study of Anthraquinone Dyes, *Chem. & Ind.* (1953), 1068
 Lubs, *Chemistry of Synthetic Dyes and Pigments* (A.C.S. Monograph 127) (1955)
 Many BIOS and FIAT Reports — in particular BIOS 987, 1484, 1493; FIAT 1313

58000 C.I. Mordant Red 11 (Aluminium in presence of Calcium \rightarrow *Bluish red*)*

58000:1 C.I. Pigment Red 83 (metal complex)

Classical name **Alizarin**



- (a) Heat dibromoanthraquinone with potassium hydroxide
- (b) Heat 2-anthraquinonesulfonic acid (Na) with sodium hydroxide and a nitrate or chlorate
- (c) Heat anthraquinone with sodium hydroxide and sodium chlorate or nitrate (GP 186526)
- (d) Heat anthraquinone with sodium hydroxide and sodium nitrate in presence of sodium sulfite (GP 241806, 245987)
- (e) Heat *meso*-nitro derivatives of anthracene with sodium hydroxide in presence of oxidising agents, sodium sulfite and lime (GP 292247)
- (f) Treat 2-anthraquinonesulfonic acid in the presence of air with potassium hydroxide moistened with alcohol (GP 287270)
- (g) Alkali fuse 2-chloroanthraquinone in presence of sodium chlorate (USP 1744815)
- (h) Treat 2-methylantraquinone with caustic alkali in presence of an oxidising agent (BP 293328)

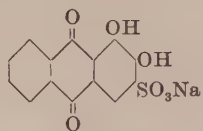
Note — For information on naturally occurring Alizarin see **C.I.75330**

* Chromium—Dull bluish red; Iron—Dull purple

Grandmougin, *Compt. rend.* **173** (1921), 717, 1176
Tigerstedt, *Bull. Soc. ind. Mulhouse*, **90** (1924), 555
Scheurer, *Bull. Soc. ind. Mulhouse*, **91** (1925), 473
Tanaka, *Proc. Imp. Acad. Tokyo*, **3** (1927), 82
Philips, *JACS*, **49** (1927), 473
Wahl, *Bull. Soc. chim.* **41** (1927) (IV), 1417
Schwenk, *Chem. Ztg.* **52** (1928), 45, 62
Minajev & Fedorov, *J. Chem. Ind. Russ.* **6** (1929), 535
Robertson, *JCS*, (1930), 1136
Iljinski & Perelmann, *Chem. Zent.* **1** (1934), 1110; **1** (1937), 422, 433
Iljinski, *Chem. Zent.* **1** (1936), 1964
Karpuchin, *Chem. Zent.* **1** (1936), 2825
Georgievics, 231, 257
Bucherer, 336, 347
Barnett, 2, et al
Fierz-David, 524
Houben, 32, et al
Möhlau-Bucherer, 216
Mayer, 161
Fierz-David, Suppl. 79, 80
Thorpe, **1**, 216
Venkataraman, 818

Soluble in acetone, alcohol (boiling), alkali, Cellosolve
Slightly soluble in benzene, carbon tetrachloride
Insoluble in alcohol (cold), Stoddard solvent
H₂SO₄ conc. — yellowish red; on dilution — reddish yellow ppt.
NaOH — violet

Discoverers — Robiquet and Colin (from Madder) 1826
C. Graebe and C. Liebermann (Prep. a) 1868
C. Graebe, C. Liebermann, and H. Caro (Prep. b) 1869
W. H. Perkin (Prep. b) 1869
Graebe & Liebermann, *BP* 3850/68; *USP* 95465
Graebe, Liebermann & Caro, *BP* 1936/69; *USP* 153536
W. H. Perkin, *BP* 1948/69, 3318/69
Dale & Schorlemmer, *BP* 216/70
M.L.B., *BP* 2649/72, 5444/94; *GP* 17627 (*Fr.* **1**, 308), 81230 (*Fr.* **4**, 334)
Auerbach & Gessert, *BP* 1269/74
Bayer, Weskott & Siller, *BP* 2071/74
Heinzerling & McGowan, *BP* 1712/75
Simpson, Brooke & Royle, *BP* 1851/76
Domeier & Marzell, *BP* 2784/80
König, *BP* 2136/81
Brönnner, *BP* 759/82
Heffter, *GP* 36289 (*Fr.* **1**, 308)
Leverkus & Söhner, *GP* 38454 (*Fr.* **1**, 309)
Schaeffer, *BP* 20010/91, 21398/98
Badische Co., *BP* 7398/04, 20664/13; *FP* 344680; *GP* 186526 (*Fr.* **8**, 237), 287270 (*Fr.* **12**, 431)
Bayer Co., *BP* 19641/08, 2354/11, 24642/11, 11915/12; *USP* 1036880, 1036881; *FP* 395137, 435118; *Russ.P.* 23391; *GP* 241806, 245987, (*Fr.* **10**, 594, 595), 249368, 251236, (*Fr.* **11**, 586, 587)
Griesheim-Elektron, *BP* 16859/14; *USP* 1150152; *FP* 475141; *GP* 292247 (*Fr.* **12**, 432)
Scottish Dyes, *BP* 174101, 246529, 293328; *USP* 1744815
BIOS 1484, 39; *FIAT* 764 — Alizarinrot B, G, R
Graebe & Liebermann, *Ber.* **1** (1868), 49, 104, 186; **2** (1869) 14, 332, 505; **3** (1870), 359, 636; *Ann. Suppl.* **7** (1870), 291
Ann. **160** (1871), 138
Strecker, *Z. Chem.* **4** (1868), 263
Perkin, *Ber.* **7** (1874), 972, 1106; **9** (1876), 281; *Ann.* **158** (1871), 319; *J. Soc. Arts*, **27** (1879), 527; *JCS*, **23** (1870), 133; **29** (1876), 851; **37** (1880), 554; **69** (1896), 627
Auerbach, *Ber.* **4** (1871), 979
Liebermann, *Ber.* **4** (1871), 108; *Ann.* **183** (1876), 206
Böttger & Petersen, *Ber.* **4** (1871), 227; *Ann.* **160** (1871), 148
Baeyer & Caro, *Ber.* **8** (1875), 152
Liebermann & Troschke, *Ber.* **8** (1875), 379
Claus, *Ber.* **8** (1875), 530
Widmann, *Ber.* **9** (1876), 856
Baeyer, *Ber.* **9** (1876), 1232
Seuberlich, *Ber.* **10** (1877), 42
Schunck & Römer, *Ber.* **10** (1877), 175; **13** (1880), 42
Liebermann & Boeck, *Ber.* **11** (1878), 1613
von Perger, *J. prakt. Chem.* **18** (1878) (2), 118
Goppelsröder, *Dingl.* **228** (1878), 96; *JSDC*, **2** (1886), 63
Liebermann & Dehnstedt, *Ber.* **12** (1879), 1293
Haushofer, *Jahresber.* (1882), 366
Levinstein, *JSCI*, **2** (1883), 213
Lukianoff, *Dingl.* **259** (1886), 97
Muller, *Chem. Ztg.* **17** (1893), 316, 374, 615
Erban and Specht, *Chem. Ztg.* **17** (1893), 542
Perkin, *JSDC*, **13** (1897), 81; *JCS*, **75** (1899), 434, 445, 452; *JSCI*, **22** (1903), 605
Lagodzinski, *Ber.* **28** (1895), 1427; **36** (1903), 4020; *Ann.* **342** (1905), 88
Wacker, *J. prakt. Chem.* **54** (1896) (2), 88
Driessen, *Bull. Soc. ind. Mulhouse*, **68** (1902), 180
Liebermann & Hohenemser, *Ber.* **35** (1902), 1779
Ritter, *Chem. Ztg.* **27** (1903), 634
Persoz, *Bull. Soc. ind. Mulhouse*, **69** (1903), 193
Decker & Laube, *Ber.* **39** (1906), 112
Heller, *Z. angew. Chem.* **19** (1906), 669
Erban, *Z. Farb.-Ind.* **6** (1907), 7, 22, 50
Romann, *Bull. Soc. ind. Mulhouse*, **73** (1907), 174
Kempf, *J. prakt. Chem.* **78** (1908) (2), 257
Fehling, *Rev. gén. Mat. col.* (1909), 74
Battegay, *Bull. Soc. ind. Mulhouse*, **75** (1909), 348
Kornfeld, *Färberztg.* **21** (1910), 217
Freiberger, *Färberztg.* **23** (1912), 85, 109; *Bull. Soc. ind. Mulhouse*, **79** (1913), 651
Schmidt, *Bull. Soc. chim.* **15** (1914) (4), Suppl. I
Knecht & Hibbert, *JSDC*, **31** (1915), 241
Dimroth & Schultze, *Ann.* **411** (1916), 339; *Ber.* **54** (1921), 3028
Leigh, *JSDC*, **32** (1916), 205
Diehl, *Färberztg.* **27** (1916), 134
Scholl, *Ber.* **52** (1919), 565, 1142, 1829
Sunder, *Bull. Soc. ind. Mulhouse*, **87** (1921), 137; **90** (1924), 72; *Rev. gén. Mat. col.* **38** (1934), 129

58005 C.I. Mordant Red 3 (Chromium-Dull bluish red)*

Sulfonate alizarin with fuming sulfuric acid and convert to the sodium salt

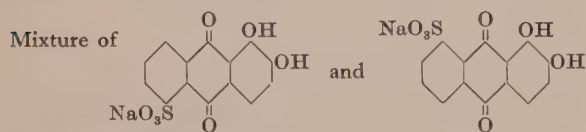
* Aluminium—Bright yellowish red

Soluble in Cellosolve

Slightly soluble in acetone, alcohol

H₂SO₄ conc. — orange; on dilution — pale yellow

Discoverers — C. Graebe and C. Liebermann 1871
 Przibram & Co., *BP* 1117/78; *GP* 3565 (*Fr.* 1, 310)
 Jacobsen, *BP* 2828/79
 Prudhomme, *GP* 15616 (*Fr.* 1, 311)
 Bayer Co., *BP* 8725/90; *GP* 56951, 56952, (*Fr.* 3, 269, 269)
FIAT 1313, 2, 223
 Graebe & Liebermann, *Ann.* **160** (1871), 144
 Perger, *J. prakt. Chem.* **18** (1878) (2), 174
 Graebe, *Ber.* **12** (1879), 571
 Schmidt, *J. prakt. Chem.* **43** (1891), 232; *Ber.* **36** (1903), 4194
 Schultz & Erber, *J. prakt. Chem.* **74** (1906) (2), 275
 Knowles, *JSDC*, **23** (1907), 120
 Attack, *JSCI*, **34** (1915), 936; *Z. anal. Chem.* **58** (1919), 363, **76** (1929), 440
 Knecht, *JCS*, **125** (1924), 1537
 Hosoda, *J. Soc. Org. Synthetic Chem., Jap.* **9** (1951), 187; (*CA*, **47** (1953), 1391)
 Georgievics, 241
 Bucherer, 343
 Barnett, 278
 Houben, 358, 404
 Fierz-David, 532

58010 Mordant Dye

(a) Sulfonate alizarin with fuming sulfuric acid in presence of mercury and convert to the sodium salt

(b) Sulfonate alizarin with fuming sulfuric acid in presence of mercury to form a mixture of 3,5- and 3,8-alizarindisulfonic acids and hydrolyse

Discoverer — M. Iljinski 1903

Erweco Alizarin Acid Red SB (RW)

Red on aluminium- and bordeaux on chromium-mordanted wool of good fastness to light and milling

Wedekind Co., *BP* 10242/03; *USP* 826509, 826510; *FP* 322709; *GP* 205965, 210863, (*Fr.* 9, 687, 688)

Iljinski, *Ber.* **36** (1903), 4199

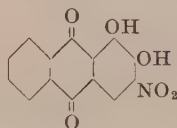
Hosoda, *J. Soc. Org. Synthetic Chem., Jap.* **9** (1951), 187; (*CA*, **47** (1953), 1391)

Fierz-David, 532

Houben, 404

Insoluble in alcohol

H₂SO₄ conc. — orange; on dilution — yellow

58015 C.I. Mordant Orange 14 (Aluminium-Reddish orange)*

(a) Nitrate alizarin in sulfuric acid in presence of boric acid

(b) Nitrate alizarin in glacial acetic acid, toluene, light petroleum or nitrobenzene

* Chromium—Reddish brown

Discoverer — A. Rosenstiehl 1876

Caro, *BP* 1229/76; *USP* 186032

Pabst & Girard, *BP* 2811/78

Bayer Co., *BP* 2695/93; *GP* 74562 (*Fr.* 3, 266)

BIOS 1484, 19; *FIAT* 764 — Alizarinorange

Strobel, *Bull. Soc. chim.* **26** (1876), 127; *Mon. sci.* **8** [3] (1878), 1337; *Ber.* **12** (1879), 584

Rosenstiehl, *Ber.* **9** (1876), 1036; *Compt. rend.* **82** (1876), 1455; **83** (1877), 73; *Ann. Chim. Phys.* **12** (1877) (5), 519

Caro, *Ber.* **10** (1877), 1760; **12** (1879), 1008

Bindschedler & Busch, *Chem. & Ind.* **1** (1878), 409

Schunck & Römer, *Ber.* **12** (1879), 583, 1008

Simon, *Ber.* **15** (1882), 692

Römer, *Ber.* **15** (1882), 694

Levinstein, *JSCI*, **2** (1883), 223

Brasch *Ber.* **24** (1891), 1610

Barnes, *JSDC*, **15** (1899), 11

Knecht & Hibbert, *JSDC*, **31** (1915), 241

Hosoda, *J. Soc. Org. Synthetic Chem., Jap.* **9** (1951), 97; (*CA*, **47** (1953), 1391)

Barnett, 281

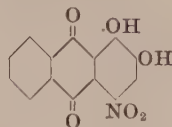
Fierz-David, 533

Houben, 393, 395

Möhlau-Bucherer, 224

Insoluble in water

H₂SO₄ conc. — dull orange; on dilution — yellow

58020 C.I. Mordant Brown 44

(a) Nitrate dibenzoylizarin and hydrolyse the product

(b) Nitrate alizarin in sulfuric acid

(c) Nitrate alizarin in sulfuric acid in presence of arsenic acid

Discoverer — W. H. Perkin 1876

M.L.B., *BP* 14717/92; *FP* 223766; *GP* 66811, 74431, (*Fr.* 3, 261, 264)

Bayer Co., *BP* 2695/93; *GP* 74598 (*Fr.* 3, 264)

FIAT 764 — Alizarinbraun

Perkin, *JCS*, **30** (1876), 578

Schunck & Römer, *Ber.* **12** (1879), 587

Brasch, *Ber.* **24** (1891), 1610

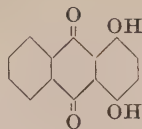
Barnett, 281, 284

Houben, 393, 395

Soluble in alcohol

H₂SO₄ conc. — yellowish red; on dilution — yellow flocculent ppt.

1,3-dihydroxyanthraquinone and its methyl, methoxy and carboxylic acid derivatives not containing amino groups appear in the Natural Dye section. See **C.I. 75340, 75350, 75360, 75370, 75540, 75550, 75560**

58050 Smoke Dye (Orange)**58050:1 C.I. Pigment Violet 12 (Aluminium salt—Violet)**Classical name **Quinizarin**

(a) Treat anthraquinone with sulfuric acid in the presence of boric acid, boric acid and mercury, boric acid and nitrous acid or nitrous acid and mercury

(b) Treat 1-hydroxyanthraquinone or 2-hydroxyanthraquinone with sulfuric acid in presence of boric and nitrous acids

(c) Treat 1-hydroxy-4-nitroanthraquinone or 1,4-dichloroanthraquinone with sulfuric acid in the presence of boric acid

(d) Condense phthalic anhydride and *p*-chlorophenol in presence of boric and sulfuric acids

Hahn, Wolf & Jäger, *Ber.* **57** (1924), 1394; *Z. anal. Chem.* **66** (1925), 106

Brass & Ziegler, *Ber.* **58** (1925), 755

Reynolds & Bigelow, *JACS*, **48** (1926), 420

Green, *JCS* (1927), 2384

Zahn & Ochwat, *Ann.* **462** (1928), 72

Georgievics, 239

Auerbach, 172, 250

Fierz-David, 501

Bucherer, 340, 348, 351, 354

Barnett, 91, et al

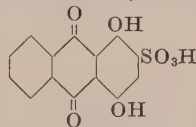
Houben, 32, et al

Thorpe, **1**, 220

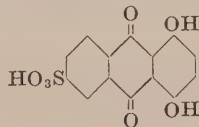
Venkataraman, 823

Soluble in ether

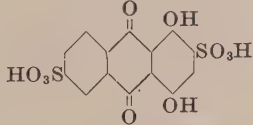
H₂SO₄ conc. — greenish yellow fluorescence

58055 C.I. Pigment Violet 5 (Sodium salt)**58055:1 C.I. Pigment Violet 5:1 (Aluminium salt***Bright reddish violet)*

Condense quinizarin with sodium bisulfite, boric acid and manganese dioxide

58060 C.I. Pigment Violet 6 (Sodium salt)**58060:1 C.I. Pigment Violet 6:1 (Aluminium salt—***Bright reddish violet)*

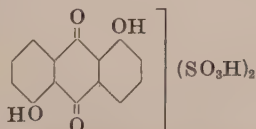
Treat quinizarin with oleum in presence of boric acid and mercury. Decompose the boric ester by boiling in water

58061 Acid DyeComplex chromium derivative of **C.I.58060****58065 C.I. Pigment Violet 7 (Sodium salt)****58065:1 C.I. Pigment Violet 7:1 (Aluminium salt—***Bright bluish violet)*

Treat **C.I.58060** with boric acid, sodium sulfite and manganese dioxide

58080 Acid Dye

Complex chromium derivative of



Discoverer — F. Grimm 1873

Dye intermediate for colouring smokes **Smoke Orange R (IG)**

Bayer Co., *BP* 973/94, 975/94, 12667/95, 27373/04, 27374/04, 1499/05, 28104/07, 12619/12; *USP* 1087412; *FP* 224740, 235896, 310329, 348927, 350957, 385358, 452244; *GP* 81245, 81960, 86630, (*Fr.* **4**, 296, 274, 301), 125579, 135561, (*Fr.* **6**, 335, 298), 161954, 162035, 162792, 163517 (*Fr.* **8**, 252, 258, 253, 251), 203083 (*Fr.* **9**, 681), 255031 (*Fr.* **11**, 588)

Badische Co., *BP* 7394/05; *USP* 754264; *FP* 338529; *GP* 153129 (*Fr.* **7**, 182)

Scottish Dyes, *BP* 209694

United Alk. Co., *BP* 245584

Du Pont, *USP* 2003859

*CIO*S XXVII—84, 62

Grimm, *Ber.* **6** (1873), 506

Kundt, *Ber.* **6** (1873), 511

Baeyer & Caro, *Ber.* **7** (1874), 968; **8** (1875), 152

Liebermann & Giesel, *Ber.* **8** (1875), 1646

Liebermann, *Ann.* **183** (1876), 184; **212** (1882), 11; *Ber.* **10** (1877), 607; **11** (1878), 1610; **35** (1902), 1496

Baeyer, *Ber.* **9** (1876), 1232

Schunck & Römer, *Ber.* **10** (1877), 554, 1225

Dralle, *Ber.* **17** (1884), 376

Liebermann & von Kostanecki, *Ber.* **19** (1886), 2330

Liebermann & Jellinek, *Ber.* **21** (1888), 1168

Lagodzinski, *Ber.* **28** (1895), 117; **39** (1906), 1717

Wacker, *J. prakt. Chem.* **53** (2) (1896), 90; *Ber.* **35** (1902), 3924

Perkin, *JCS*, **75** (1899), 453

Pleus, *Ber.* **35** (1902), 2993

Georgievics, *Z. Farb.-Ind.* **1** (1902), 623; **4** (1905), 187; *Mhft. Chem.* **32** (1911), 329

Dienel, *Ber.* **39** (1906), 926, 931

Haslinger, *Ber.* **39** (1906), 3537

Grandmougin, *J. prakt. Chem.* **76** (2) (1907), 139

Pisovschi, *Ber.* **41** (1908), 1436

Schmidt, *Bull. Soc. ind. Mulhouse*, **80** (1914), 431

Meyer & Sander, *Ann.* **420** (1920), 113

Ullmann & Conzetti, *Ber.* **53** (1921), 833

Scholl, Dahl & Hansgirt, *Ber.* **56** (1923), 2548

Discoverer — Bayer Co.

Bayer Co., *GP* 285614, 287867, (*Fr.* **12**, 516, 436)

BIOS 1484, 65; *BIOS* 1661, 71

FIAT 764 — Helioechtrubin 4BL

BIOS 1484, 64; *BIOS* 1661, 71

FIAT 764 — Helioechtrubin 3BL

Discoverer — Badische Co.

Erganon Grey B (B)

FDX 885 (*PB* 74748) — Erganongrau B

Discoverer — I.G.

I.G., *GP* 504599, 534930 (*Fr.* **17**, 1168)

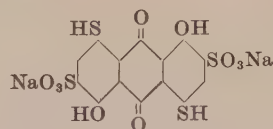
BIOS 1484, 66; *BIOS* 1661, 72

FIAT 764 — Helioechtrubin 6BL

Discoverer — Badische Co.

Erganon Violet R (B)

FDX 885 (*PB* 74748) — Erganonviolett R

58100 Acid Dye

Treat 1,5-dihydroxy-4,8-dinitro-2,6-anthraquinonedisulfonic acid with sodium sulfide and convert to the sodium salt

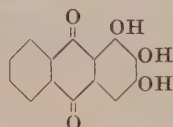
Insoluble in alcohol

H₂SO₄ conc. — reddish brown; on dilution — red → violet → bluish green ppt.

Some 1,5-, 1,6- and 1,8-dihydroxyanthraquinone derivatives appear in the Natural Dye section. See C.I. 75380, 75390, 75400

58200 C.I. Mordant Brown 42 (Chromium–Dull brown)

Classical name **Anthragallol**



- (a) Heat gallic acid with benzoic and sulfuric acids
- (b) Heat gallic acid with phthalic anhydride in the presence of zinc chloride
- (c) Reduce 2-hydroxy-1,3-dinitroanthraquinone in strong alkali solution
- (d) Heat 1,3-diamino-2-hydroxyanthraquinone with hydrochloric acid under pressure

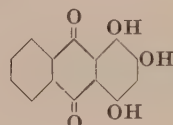
Note — Free acids used for paste brands

Sodium salts used for powder brands

| | free acid | sodium salt |
|--|-----------------------|-------------|
| H ₂ SO ₄ conc. — | brownish red | brown |
| on dilution — | brown flocculent ppt. | amber |

58205 Mordant Dye

Classical name **Purpurin**



- (a) Oxidise alizarin with manganese dioxide and sulfuric acid
- (b) Heat xanthopurpurin with aqueous caustic potash
- (c) Condense phthalic anhydride with hydroxyhydroquinone

Note — For information on naturally occurring Purpurin see C.I. 75410

Liebermann & v. Kostanecki, *Ann.* **240** (1887), 267
 Brasch, *Ber.* **24** (1891), 1614
 Offermann, *Ann.* **280** (1894), 4
 Wacker, *J. prakt. Chem.* **54** (1896) (2), 90
 Liebermann & Hohenemser, *Ber.* **35** (1902), 1781
 Dimroth & Fick, *Ann.* **411** (1916), 321
 Schultz & Erber, *J. prakt. Chem.* **74** (1925) (2), 285
 Green, *JCS*, **129** (1926), 2198
 Tanaka, *Proc. Imp. Acad. Tokyo*, **3** (1927), 345
 Marshall, *JCS*, (1931), 3206
 Hosoda, *J. Soc. Org. Synthetic Chem., Jap.* **9** (1951), 188; (*CA*, **47** (1953), 1391)
 Auerbach, 199, 268
 Georgievics, 230
 Barnett, 260, 262, 265, 281, 356
 Fierz-David, 534
 Houben, 32, 228, 306, 330, 335, 362, 368
 Möhlau-Bucherer, 218

Slightly soluble in alcohol

H₂SO₄ conc. — red; on dilution — reddish brown ppt.
 Boiling alum — readily soluble with a yellowish red colour and a green fluorescence. (Distinction between natural alizarin, which contains purpurin, and synthetic alizarin)

Discoverer — R. E. Schmidt 1905

Alizarine Emeraldol G (By)

Applied from a Glauber's salt-acetic acid bath, exhausted with sulfuric acid, after-treatment with sodium dichromate giving increased fastness to milling with considerable change in hue. Levelling good

Fastness Properties: Carbonising, good; Light, very good; Milling, fair; Washing, good

Bayer Co., *BP* 20359/05; *USP* 826750; *FP* 358271; *GP* 172575, 176955, 178840, 179671, 180016, (*Fr.* **8**, 331, 335, 332, 333, 334)

M.L.B., *GP* 188605 (*Fr.* **9**, 705)

Georgievics, 252

Fierz-David, 522

Houben, 32, 522

Discoverers — C. Seuberlich 1877; R. Bohn 1886

Simon, *USP* 686356; *GP* 119755 (*Fr.* **6**, 333)

Seuberlich, *Ber.* **10** (1877), 38; **20** (1887), 867, 870

Auerbach, *Chem. Ztg.* **6** (1882), 910

Liebermann & v. Kostanecki, *Ber.* **18** (1885), 2148; **19** (1886), 2331

Cahn, *Ber.* **19** (1886), 2334

Knecht, *JSDC*, **2** (1886), 154; **3** (1887), 174

Liebermann & Jellinek, *Ber.* **21** (1888), 1169

Perkin, *JCS*, **75** (1899), 435

Perkin & Hummel, *JCS*, **63** (1893), 1163

Bentley & Weizmann, *JCS*, **93** (1908), 435

Green, *JCS*, **129** (1926), 2198

Georgievics, 241

Barnett, 250, 260

Houben, 251, 305, 317, 339, 362, 368

Soluble in water (sodium salt)

Slightly soluble in *o*-chlorophenol (sodium salt)

Insoluble in water (free acid). Sodium salt insoluble in acetone, alcohol, benzene, carbon tetrachloride, Cellosolve, chloroform, pyridine, Stoddard solvent, toluene

Discoverers — Robiquet and Colin (from Madder) 1826
 F. de Lalande (oxidation of alizarin) 1874
 H. Caro (from *α*-nitroalizarin) 1876

Purpurin

Scarlet on aluminium- and dull red on chromium-mordanted cotton of inferior light fastness to Alizarin (C.I. 58000)

de Lalande, *BP* 2841/74

Grawitz, *BP* 4138/75

Caro, *BP* 1229/76

Diehl, *FP* 104146

Bayer Co., *GP* 81481, 81960, (*Fr.* **4**, 272, 274)

M.L.B., *GP* 97688 (*Fr.* **5**, 273)

Badische Co., *BP* 7394/03; *USP* 754264; *FP* 338529; *GP* 153129 (*Fr.* **7**, 182)

Newport Chem. Col. Wks., *USP* 1790932

Du Pont, *USP* 1985452

CIO XXVII-84, 62; *FIAT* 1313, 2, 210

FIAT 764 — Rauchbraun G

Robiquet & Colin, *Bull. Soc. ind. Mulhouse*, **1** (1826), 146

Debus, *Ann.* **66** (1848), 358; **86** (1853), 117; *Ann. Suppl.* **7** (1870), 304

Wolff & Strecker, *Ann.* **75** (1850), 20

Stenhouse, *Ann.* **130** (1864), 337

Kopp, *Bull. Soc. chim.* **2** (1864) (2), 231

Schützenberger & Schiffert, *Bull. Soc. chim.* **4** (1865) (2), 12

Graebe & Liebermann, *Ber.* **1** (1868), 104

Auerbach, *Ber.* **4** (1871), 979

de Lalande, *Compt. rend.* **79** (1874), 669; *Ber.* **7** (1874), 1545; **9** (1876), 644

Diehl, *Monit. sci.* **4** [3] (1874), 1149

Rosenstiehl, *Compt. rend.* **79** (1874), 765

Baeyer & Caro, *Ber.* **8** (1875), 152

Liebermann & Fischer, *Ber.* **8** (1875), 974

Liebermann, *Ann.* **183** (1876), 211

Liebermann & Giesel, *Ber.* **10** (1877), 608

Schunck & Römer, *Ber.* **10** (1877), 172, 552

v. Perger, *J. prakt. Chem.* **18** (1878) (2), 120, 124, 176, 191

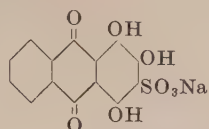
Caro, *Ann.* **201** (1880), 353

Dralle, *Ber.* **17** (1884), 376

Noah, *Ber.* **19** (1886), 333

58210 C.I. Pigment Red 84 (Aluminium lake—

Bright bluish red)*



(a) Treat purpurin with sodium sulfite under pressure in presence of manganese dioxide

(b) Treat **C.I.58005** with nitric and sulfuric acids and convert to the sodium salt

* Chromium—Bordeaux

Discoverer — M.L.B.

M.L.B., *BP* 12094/95; *FP* 248350; *GP* 84774 (*Fr.* 4, 279)
Bayer Co., *USP* 746405; *FP* 334658; *GP* 89027 (*Fr.* 4, 322),
155045 (*Fr.* 7, 184), 172688 (*Fr.* 8, 259), 281422, 286487,
287867, 288474, 289112, (*Fr.* 12, 513, 515, 436, 437, 438)

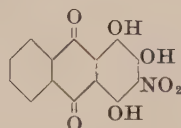
BIOS 1661, 70

Egriwe, *Z. anal. Chem.* 76 (1924), 438

Barnett, 259, 263, 278

Houben, 398, 404

H₂SO₄ conc. — reddish orange; on dilution — unaltered

58215 Mordant Dye

(a) Nitrate alizarin with fuming nitric acid and boil the product with water

(b) Nitrate purpurin

Purpurin (B) and (By)

Red on aluminium-mordanted cotton

Strecker, *Z. Chem.* (1868), 264

Brasch, *Ber.* 24 (1891), 1610, 1615

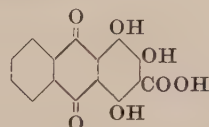
Barnett, 263, 279, 281

Houben, 393, 394, 396

H₂SO₄ conc. — red; on dilution — cherry red ppt.

58220 Pigment

Classical name **Pseudopurpurin**



(a) Oxidise 3-purpurincarboxylic acid with sulfuric acid and manganese dioxide

(b) Fuse 3-chloro-2-anthraquinonecarboxylic acid with alkali hydroxides and oxidise

Note — For information on naturally occurring pseudopurpurin see **C.I.75420**

Discoverers — M. P. Schützenberger and M. H. Schiffert 1864

Pseudopurpurin

Aluminium lake used as artists' colour (*C.I.1043* (1st Edn.) — unconfirmed)

Bayer Co., *BP* 29506/12, 22980/13; *FP* 451927; *GP* 250742,
260765, 272301, (*Fr.* 11, 591, 591, 592), 281422, 286487,
(*Fr.* 12, 513, 515)

Schützenberger & Schiffert, *Bull. Soc. chim.* 4 (1865), 13; *Bull. Soc. ind. Mulhouse*, 34 (1868), 70

Rosenstiehl, *Ber.* 7 (1874), 1546, *Compt. rend.* 79 (1875), 680; 83 (1877), 827; 84 (1877), 559, 1092

Liebermann & Plath, *Ber.* 10 (1877), 614, 1618

Perkin & Cope, *JCS*, 65 (1894), 847

Schmidt, *Bull. Soc. ind. Mulhouse*, 84 (1914), 409

Fierz-David, 537 and Suppl. 69

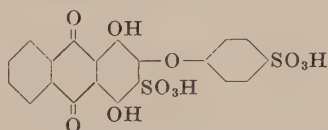
Houben, 350, 363, 502

Mayer, 165

Soluble in chloroform

H₂SO₄ conc. — yellowish red

H₂SO₄ + boric acid — bluish red with strong red fluorescence

58225 C.I. Pigment Violet 20 (Bright reddish violet)

Condense 2-bromo-1,4-dihydroxyanthraquinone with phenol in the presence of potassium carbonate. Sulfonate with oleum and boric acid and decompose the boric ester with sodium bisulfite

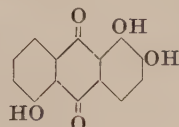
Discoverer — F. Baumann 1930

I.G., *BP* 359051; *USP* 1917421, 1982149; *GP* 541714 (*Fr.* 18, 1253)

BIOS 1484, 66; *BIOS* 1661, 73

FIAT 764 — Helioechtrubin FF

Note—C.I. Pigment Violet 26 is similar

58230 C.I. Mordant Red 45 (Aluminium—Bordeaux)*

(a) Oxidise alizarin with fuming sulfuric acid in presence of boric acid and hydrolyse

(b) React 5,6-dihydroxy-1-anthraquinonesulfonic acid with caustic soda

(c) Oxidise anthrarufin with sodium nitrate and sodium hydroxide or, preferably, a mixture of sodium and potassium hydroxides

* Chromium—Dull bordeaux

Discoverer — L. Wolmann 1903

Bayer Co., *BP* 8282/04; *USP* 772857; *FP* 342195; *GP* 156960,
178631, (*Fr.* 8, 254, 255)

M.L.B., *GP* 195028 (*Fr.* 8, 1361), 196980 (*Fr.* 9, 691)

FIAT 764 — Brillantalizarinbordo R

Liebermann & Boeck, *Ber.* 11 (1878), 1617

Schunck & Römer, *Ber.* 11 (1878), 1177

Liebermann & Dehnstedt, *Ber.* 12 (1879), 1289

Graebe & Thode, *Ann.* 349 (1906), 207

Fischer & Ziegler, *J. prakt. Chem.* 86 (1912) (2), 297

Schmidt, *Bull. Soc. ind. Mulhouse*, 84 (1914), 428

Fierz-David, 542

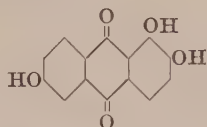
Houben, 328, 363, 370

Soluble in alcohol, glacial acetic acid

H₂SO₄ conc. — dull violet; on dilution — yellowish orange ppt.

H₂SO₄ + boric acid — blue

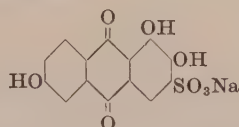
1,2,5-Trihydroxy-6-methylantraquinone appears in the Natural Dye section. See **C.I.75430**

58240 C.I. Mordant Red 4 (Chromium-Dull red)Classical name **Flavopurpurin**

Heat 2,6-anthraquinonedisulfonic acid under pressure with sodium hydroxide and potassium chlorate, or potassium or sodium nitrate, and separate from the 2,6-dihydroxyanthraquinone formed simultaneously

Soluble in alcohol (hot), Cellosolve
Slightly soluble in acetone, alcohol (cold), benzene, chloroform
Insoluble in Stoddard solvent
 H_2SO_4 conc. — dull reddish brown; on dilution — yellowish orange ppt.

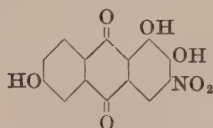
Discoverers — E. Schunck and H. Römer 1876
M.L.B., BP 23644/98; FP 282937; GP 106505 (Fr. 5, 275)
Wedekind Co., BP 20201/01; FP 314914; GP 137948, 140127, 140129, (Fr. 6, 1309, 1311, 1313), 194955 (Fr. 9, 692)
Bayer Co., BP 24601/08; GP 205097, 223103, (Fr. 9, 693, 1196)
Schunck & Römer, Ber. 9 (1876), 678; 10 (1877), 1821; 13 (1880) 42
Caro, Ber. 9 (1876), 682
Liebermann & v. Kostanecki, Ber. 19 (1886), 2331
Liebermann, Ber. 21 (1888), 441
Jellinek, Ber. 21 (1888), 2524
Schmidt, J. prakt. Chem. 43 (1891) (2), 236
Recklinghausen, Ber. 26 (1893), 1515
Offermann, Ann. 280 (1894), 12
Bistrzycki & Schepper, Ber. 31 (1898), 2799
Frobenius & Hepp, Ber. 40 (1907), 1049
Barnett, 253, 260, 271, 275, 281
Houben, 320, 328, 330, 351, 354, 361, 363, 370, 400
Georgievics, 238
Bucherer, 338, 355

58245 Mordant Dye

Sulfonate flavopurpurin (C.I.58240), and convert to the sodium salt

Discoverer — M.L.B. 1886
Alizarin Red 3WS (MLB)
Reddish brown on chromium- or aluminium-mordanted wool
Houben, 404

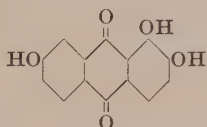
Slightly soluble in alcohol
 H_2SO_4 conc. — yellowish red; on dilution — light yellow

58250 Mordant Dye

(a) Nitrate flavopurpurin (C.I.58240) in presence of glacial acetic acid
(b) Nitrate flavopurpurin boric ester

Discoverer — M.L.B. 1889
Alizarin Orange G (MLB)
Orange on aluminium-mordanted wool or cotton of good fastness to chlorine, light, milling and stoving (C.I.1042 (1st Edn.) — unconfirmed)
M.L.B., BP 11666/89
Bayer Co., BP 2695/93; GP 74562 (Fr. 3, 266)

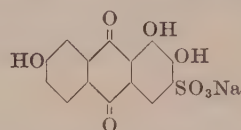
Soluble in alcohol
 H_2SO_4 conc. — reddish orange; on dilution — pale yellowish orange ppt.

58255 Mordant Dye (Chromium-Dull red)Classical name **Anthrapurpurin**

Heat 2,7-anthraquinonedisulfonic acid with sodium hydroxide and potassium chlorate under pressure and separate from the 2,7-dihydroxyanthraquinone formed simultaneously

Soluble in alcohol, Cellosolve
Slightly soluble in acetone, benzene, chloroform, water (hot)
Insoluble in Stoddard solvent, water (cold)
 H_2SO_4 conc. — reddish brown; on dilution — yellowish orange ppt.

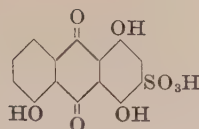
Discoverer — W. H. Perkin 1872
M.L.B., BP 23644/98; FP 282937; GP 106505 (Fr. 5, 275)
Wedekind Co., BP 20201/01; FP 314914; GP 137948, 140127, 140129, (Fr. 6, 1309, 1311, 1313), 194955 (Fr. 9, 692)
Bayer Co., BP 24601/08; GP 205097, 223103, (Fr. 9, 693, 1196)
Perkin, JCS, 25 (1872), 659; 26 (1873), 425; 29 (1876), 851; 37 (1880), 557
Auerbach, Monit. sci. 2 [3] (1872), 368, 686; 9 [3] (1879), 872
Schunck & Römer, Ber. 9 (1876), 678; 10 (1877), 1821; 11 (1878), 972; 13 (1880), 42
Caro, Ber. 9 (1876), 682
Rosenstiehl, Bull. Soc. chim. 29 (1878), 405; Ann. Chim. Phys. 15 (1878) (5), 272
Liebermann & v. Kostanecki, Ber. 19 (1886), 2331; 21 (1888), 443
Schmidt, J. prakt. Chem. 43 (1891) (2), 232, 236
Recklinghausen, Ber. 26 (1893), 1515
Offermann, Ann. 280 (1894), 15, 31
Noelting & Wortsman, Ber. 39 (1906), 642
Graebe & Bernhard, Ann. 349 (1906), 226
Knecht & Hibbert, JSDC, 31 (1915), 241
Georgievics, 238
Auerbach, 208, 249
Bucherer, 338, 355
Barnett, 253, 260, 271, 275, 282
Houben, 319, 328, 330, 351, 361, 364, 370, 400

58260 C.I. Mordant Red 2 (Chromium-Dull red)

Sulfonate anthrapurpurin (C.I.58255), and convert to the sodium salt

Discoverer — M.L.B. 1886
Slightly soluble in alcohol
 H_2SO_4 conc. — yellowish red; on dilution — light yellow

1,3,8-Trihydroxy-2-methylantraquinone appears in the Natural Dye section. See C.I.75440

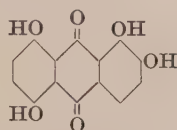
58300 Pigment

Sulfonate 1,4,5-trihydroxyanthraquinone in the presence of boric acid

7-Acetyl-6-ethyl-3,5,8-trihydroxy-1,2-anthraquinonedicarboxylic acid appears in the Natural Dye section. See C.I.75460

58500 C.I. Mordant Violet 26 (Chromium-Violet)

Classical name **Quinalizarin**



Oxidise alizarin or quinizarin with a large excess of fuming sulfuric acid and hydrolyse

Discoverer — I.G.

Helio Fast Violet AL (IG)

FDX 885 (PB 74762) — Helioechtviolett AL

Discoverer — R. E. Schmidt 1890

Bayer Co., BP 8725/90, 17712/90, 4871/91; USP 446893; FP 206564; GP 60855, 63693, 67063, (Fr. 3, 198, 201, 203) BIOS 1484, 27

Liebermann & Wense, Ber. 20 (1887), 862

Graebe, Ber. 23 (1890), 3739; Ann. 349 (1906), 205

Schmidt, J. prakt. Chem. 43 (1891) (2), 237; Bull. Soc. ind. Mulhouse, 84 (1914), 428

Hahn, Wolf & Jäger, Ber. 57 (1924), 1394

Eegriwe, Z. anal. Chem. 76 (1929), 354

Barnett, 257, 259, 260, 264

Fierz-David, 542

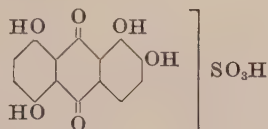
Houben, 326, 330, 366, 370

Soluble in alcohol

H₂SO₄ conc. — bluish violet; on dilution — dull red ppt.

58501 Acid Dye

Complex chromium derivative of



Discoverer — Badische Co.

Erganon Blue B (B)

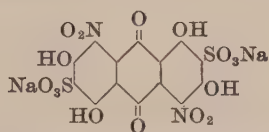
FDX 885 (PB 74748) — Erganonblau B

58505 Mordant Dye

Oxidise C.I.58500 and treat first with salicylic acid and then with ammonia in the presence of boric acid

H₂SO₄ conc. — red; on dilution — darker red ppt.

2,5,7,8-Tetrahydroxy-1-anthraquinonecarboxylic acid derivatives appear in the Natural Dye section. See C.I.75460, 75470

58510 Mordant Dye

Sulfonate 1,3,5,7-tetrahydroxyanthraquinone, dinitrate the disulfonic acid formed, and convert to the sodium salt

Discoverer — H. Laubmann 1892

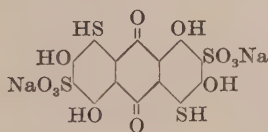
Dinitroanthrachrysone disulfonic acid (MLB)

Brown on wool by the metachrome or afterchrome process, fast to light and milling (C.I.1047 (1st Edn.) — unconfirmed) M.L.B., BP 188/93; GP 70803, 70806, 71964, (Fr. 3, 242, 243, 244), 139425 (Fr. 7, 174)

Barth & Senhofer, Ann. 159 (1871), 217

Soluble in alcohol

H₂SO₄ conc. — dull yellow; on dilution — yellow

58515 Mordant Dye

Treat C.I.58510 with sodium sulfide

Discoverer — H. Laubmann 1893

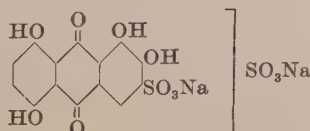
Acid Alizarin Green B, G (MLB)

Wool dyed from an acid bath greenish blue and converted to green on afterchroming. Fastness to light and washing, good (C.I.1049 (1st Edn.) — unconfirmed)

M.L.B., BP 13395/93; FP 231479; GP 73684 (Fr. 3, 246), 77720 (Fr. 4, 338)

Houben, 522

Insoluble in alcohol

58520 Mordant Dye

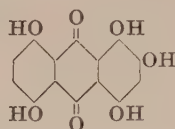
Sulfonate C.I.58500 with chlorosulfonic acid and convert to the sodium salt

Discoverer — Bayer Co.

Alizarine Cyanine 3RS (By)

Wool dyed from an acid bath cherry red, converted by aftertreatment with chromium fluoride into pure blue of only moderate fastness to carbonising, light, milling, stoving and washing (C.I.1063 (1st Edn.) — unconfirmed)

FIAT 764; FDX 885 (PB 82170) — Alizarincyanin 3RS

58550 C.I. Mordant Blue 50 (Chromium-Greenish navy)

Oxidise **C.I.58500** in sulfuric acid with manganese dioxide and reduce the quinone so formed with sulfurous acid

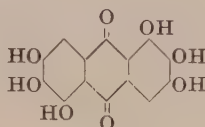
Discoverer — R. E. Schmidt 1890

Bayer Co., *BP* 12715/90, 17712/90, 4871/91, 12579/92; *USP* 446892, 506265; *FP* 206564, 281125; *GP* 62018, 62504, 62505, 62506, 66153, 68114, 74353, (*Fr.* 3, 212, 213, 214, 215, 215, 220, 229)

Schmidt, *J. prakt. Chem.* **43** (1891) (2), 242
Gattermann, *J. prakt. Chem.* **43** (1891) (2), 250
Georgievics, 248
Bucherer, 349, 351
Barnett, 264
Fierz-David, 544
Houben, 329, 367, 370, 534

58600 Mordant Dye

Classical name **Rufigallol**



Treat gallic acid with sulfuric acid

Discoverer — Robiquet 1835

Rufigallol (B)

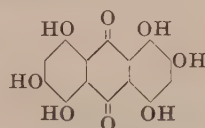
Brown on chromium-mordanted wool

Bayer Co., *GP* 114236 (*Fr.* 6, 332)
Read Holliday, *BP* 126528
Robiquet, *Ann.* **19** (1836), 204
Jaffé, *Ber.* **3** (1870), 695
Schiff, *Ann.* **163** (1872), 218
Klobukowsky & Nölting, *Ber.* **8** (1875), 931
Klobukowsky, *Ber.* **9** (1876), 1256
Liebermann, v. Kostanecki & Noah, *Ann.* **240** (1887), 270; **244** (1888), 1888
Liebermann & Jellinek, *Ber.* **21** (1888), 1171
Löwe, *J. prakt. Chem.* **107** (1924), 298
Barnett, 126, 272
Fierz-David, 536
Houben, 305, 329, 339, 370

H₂SO₄ conc. — red

58605 C.I. Mordant Blue 32 (Chromium-Reddish navy)

Mainly



(a) Treat 1,5-dinitroanthraquinone (or crude dinitroanthraquinone) with or without sulfur with fuming sulfuric acid. Separate the product and treat with sulfuric acid

(b) Treat flavopurpurin (**C.I.58240**) with oleum

Note — Commercial products contain also 1,2,4,5,7,8-hexahydroxyanthraquinone (**C.I.58615**)

Discoverer — R. Bohn 1891

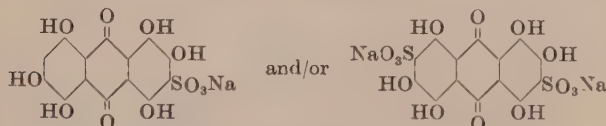
Badische Co., *BP* 19588/91, 19589/91, 13029/92, 13147/92, 1962/97; *USP* 500917, 502603, 519229, 503295; *GP* 67102, 71435, 72685, 76262, (*Fr.* 3, 254, 255, 256, 257), 76941, 87729, 88083, 92800, 92998, (*Fr.* 4, 285, 283, 286, 287, 285), 120622 (*Fr.* 6, 340)

Bayer Co., *BP* 17674/92 (refused), 14345/93, 974/94, 19009/98
FP 224740, 235896, 281125; *GP* 79768, 81244, 83055, 96197, (*Fr.* 4, 293, 295, 297, 292), 101486, 105567, (*Fr.* 5, 280, 277)
M.L.B., *BP* 21167/92, 21168/92; *GP* 81743 (*Fr.* 4, 338)
Lifschütz, *Ber.* **17** (1884), 893
Schmidt & Gattermann, *Ber.* **29** (1896), 2934
Schmidt, *J. prakt. Chem.* **43** (1891) (2), 243; *Bull. Soc. ind. Mulhouse*, **84** (1914), 409

Gattermann, *J. prakt. Chem.* **43** (1891) (2), 250
Georgievics, 248
Bucherer, 349, 351
Barnett, 257, 260, 279
Fierz-David, 544
Houben, 312, 330, 367, 372, 534
Möhlau-Bucherer, 222

Soluble in Cellosolve
Slightly soluble in acetone, alcohol
Insoluble in chloroform, Stoddard solvent

H₂SO₄ conc. — reddish blue (brownish red fluorescence); on dilution — brown ppt.

58610 C.I. Mordant Blue 23 (Chromium-Reddish navy)

(a) Treat 4,8-diamino-1,3,5,7-tetrahydroxy-2,6-anthraquinone disulfonic acid with boiling alkali or dilute acid and convert to the sodium salt

(b) Treat 1,5-dinitroanthraquinone with fuming sulfuric acid in presence of sulfur sufficient to produce S₂O₃ at 130°C, hydrolyse with water, and convert to the sodium salt

(c) Sulfonate 1,2,4,5,6,8-hexahydroxyanthraquinone with oleum and convert to the sodium salt

Discoverers — R. Bohn 1891; H. Laubmann 1893

Badische Co., *BP* 19588/91, 19589/91, 13029/92; *USP* 502603; *GP* 67102, 76262, (*Fr.* 3, 254, 257), 87729 (*Fr.* 4, 283)

M.L.B., *BP* 17543/93; *FP* 232906; *GP* 75490 (*Fr.* 4, 337), 104750 (*Fr.* 5, 272)

Bayer Co., *BP* 12580/92, 19009/98; *FP* 221233, 281125; *GP* 69934 (*Fr.* 3, 226), 105567 (*Fr.* 5, 277)

FIAT 764 — Alizarincyanin BBS,
Schmidt, *Bull. Soc. ind. Mulhouse*, **84** (1914), 409
Barnett, 246, 279
Fierz-David, 547
Houben, 315, 404

Soluble in Cellosolve, water (wine red)
Slightly soluble in alcohol
Insoluble in benzene, chloroform, Stoddard solvent
H₂SO₄ conc. — fluorescent bluish red; on dilution — red
HCl conc. added to aq. soln. — red
NaOH conc. — added to aq. soln. — reddish blue

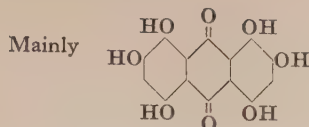
58611 Acid Dye

Complex chromium derivative of **C.I.58610**

Discoverer — Badische Co.

Erganon Blue 3G (B)

FDX 885 (*PB* 74748) — Erganonblau 3G

58615 Mordant Dye

- (a) Oxidise quinalizarin (**C.I.58500**) in sulfuric acid with manganese dioxide and reduce the quinone formed with sulfurous acid
 (b) Oxidise anthrapurpurin (**C.I.58255**) with oleum

Note — Commercial products contain also 1,2,4,5,6,8-hexahydroxyanthraquinone (**C.I.58605**)

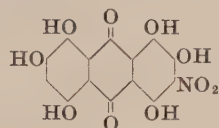
Discoverer — R. E. Schmidt 1891

Alizarin Cyanine R (By)

Reddish blue on chromium-, and reddish violet on aluminium-mordanted cotton, fast to light and washing. Blue on chromium-mordanted wool, or when afterchromed with chromium fluoride, fast to light and milling (*C.I.1064* (1st Edn.) — unconfirmed)

Bayer Co., *BP* 4871/91; *USP* 506265; *FP* 206564; *GP* 66153 (*Fr.* 3, 215)

Fierz-David & Blangey, Table 17

58620 Mordant Dye

Oxidise 1,2,7-trihydroxy-3-nitroanthraquinone in sulfuric acid with manganese dioxide and then reduce with sulfurous acid

Discoverers — R. E. Schmidt and P. Tust 1892

Alizarine Cyanine Black G (By)

Bluish black on wool, fast to light, milling and stoving when afterchromed (*C.I.1065* (1st Edn.) — unconfirmed)

Bayer Co., *BP* 12580/92; *USP* 496139; *FP* 219069; *GP* 69933 (*Fr.* 3, 224)

Schmidt, *Bull. Soc. chim.* 15 (1914) (4) Suppl. XXIII
Georgievics, 249

Houben, 367, 446

Insoluble in alcohol

H₂SO₄ conc. — reddish violet; on dilution — reddish brown ppt.

58800 C.I. Acid Blue 8 (Dull greenish blue → Navy)

Probably a mixture of nitrogen-containing polyhydroxyanthraquinones

Heat 1,5- and 1,8-dinitroanthraquinone in 30% oleum with sulfur in the presence of boric acid

Discoverer — M. H. Isler 1897

Diamond Cyanine 3G (By)

Badische Co., *BP* 16495/97; *USP* 617686; *FP* 269849; *GP* 109613 (*Fr.* 5, 281)

FIAT 1313, 2, 237

Slightly soluble in alcohol

H₂SO₄ conc. — dull violet; on dilution — violet

58805 C.I. Mordant Blue 8 (Chromium-Navy)

Variously stated to be

- (a) a polyhydroxyanthraquinone
 (b) a mixture of diaminodi (and tri)hydroxyanthraquinonemono- (or di)sulfonic acids

Treat 1, 5- or a mixture of 1, 5- and 1, 8-dinitroanthraquinone with oleum, sulfur and boric acid, and convert to the sodium salt

Discoverer — R. Bohn 1891

Badische Co., *BP* 19588/91, 19589/91, 13029/92, 15325/92, 1962/97; *USP* 502603; *GP* 67102, 76262, (*Fr.* 3, 254, 257), 87729, 89144, 92800, 92998, (*Fr.* 4, 283, 288, 287, 285)

Bayer Co., *FP* 281125; *GP* 105567 (*Fr.* 5, 277)

*BIO*S 1484, 45

Schmidt & Gattermann, *Ber.* 29 (1896), 2934

Barnett, 247

Houben, 372

H₂SO₄ conc. — reddish brown

58810 Mordant Dye

Prolonged action of ammonia under pressure on **C.I.58805** in presence of caustic soda

H₂SO₄ conc. — yellowish red

Discoverer — O. Bally 1899

Badische Co., *BP* 14117/99; *USP* 654505; *FP* 290706; *GP* 119959 (*Fr.* 6, 339)

Soluble in alcohol

58815 Vat Dye (Brown)

Heat anthraquinone with sulfuric acid and copper powder

H₂SO₄ conc. — dull brown; on dilution — brown ppt.
 Na₂S₂O₄, alkaline — brownish violet

Discoverer — J. Deinet 1906

Leucol Brown B (By)

Fastness Properties: Chlorine, poor; Light, good (*C.I.1154* (1st Edn.) — unconfirmed)

Bayer Co., *BP* 16962/07, 25507/07; *USP* 874743; *FP* 380176; *GP* 194197, 203436, (*Fr.* 9, 805, 803)

Insoluble in xylene

58820 Vat Dye (Yellowish brown)

Treat anthraquinonemono (or di)sulfonic acid(s) or the corresponding thiol(s) with sodium sulfide

H₂SO₄ conc. — olive brown; on dilution — brown ppt.
 Na₂S₂O₄, alkaline — violet brown

Discoverer — P. Thomaschewski 1909

Algol Brown B (By)

Fastness Properties: Chlorine, moderate; Light, excellent (*C.I.1166* (1st Edn.) — unconfirmed)

Bayer Co., *BP* 4537/10; *USP* 961388; *FP* 412938; *GP* 226879 (*Fr.* 10, 743)

Insoluble in pyridine, xylene

58825 C.I. Vat Green 7 (Olive)

Heat anthracene with sulfur, with or without the addition of metallic oxides, hydroxides or salts

Na₂S₂O₄, alkaline — bluish olive; acid — brown

Discoverer — M. H. Isler 1906

Badische Co., *BP* 20132/06; *USP* 922282; *FP* 374286; *GP* 186990 (*Fr.* 9, 806)

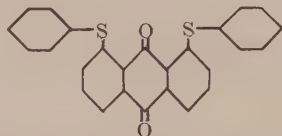
Insoluble in acetic acid, alcohol, xylene

H₂SO₄ conc. — dull brown; on dilution — brownish black ppt.

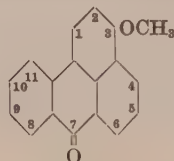
58830 C.I. Vat Green 14 (Olive)

Treat anthracene with sulfur chloride at high temperatures

Discoverer — Cassella Co.

Cassella Co., *GP* 242029, 247416, (*Fr.* 10, 734, 734) H_2SO_4 conc. — dull orange $\text{Na}_2\text{S}_2\text{O}_4$, alkaline — bluish green; acid — olive**58840 Pigment****Amaplast Yellow GHS (AAP)**

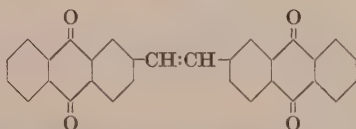
Discoverer — Allied Chem. Corp. 1964

BP 1105568; *Canad.P* 781541; *FP* 1446826; *GP* 1282933**58900 C.I. Disperse Yellow 13 (Bright greenish yellow)**

Discoverers — P. G. Carter, R. H. Sennett, C. Shaw and I.C.I. 1934

I.C.I., *BP* 447134Ellis, *JSDC*, **47** (1941), 354I.G., *GP* 479286

Treat 3-bromobenzanthrone with sodium methoxide in methanol

 H_2SO_4 conc. — bluish violet**58950★ Vat Dye (Greenish yellow)**(a) Condense 2-methylantraquinone (or its ω -dihalogeno derivatives) in presence of potassium hydroxide or lead oxide

(b) Condense 2-(dihalogenomethyl)anthraquinone in the presence of copper powder

(c) Treat 2-(chloromethyl)anthraquinone with sodium sulfide to form bis(2-anthraquinonylmethyl) sulfide. Heat the latter above its melting point (250°C)

Slightly soluble in chloroform (hot), *o*-chlorophenol, pyridine

Insoluble in acetone, alcohol, toluene, xylene

 H_2SO_4 conc. — reddish violet; on dilution — yellow ppt. $\text{Na}_2\text{S}_2\text{O}_4$, alkaline — brownish red

Discoverer — M. H. Isler 1905

Anthraflavone G (B)

Application method A/Q2

Fastness Properties (C): Chlorine 5, Light 4

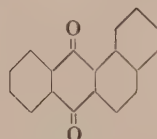
Tendering of cellulose on exposure to light accelerated

Greens produced by a mixture of this dye with C.I. 69800 possess good light fastness

Badische Co., *BP* 10677/05, 16632/05; *USP* 837840, 893507;*FP* 355100; *GP* 179893 (*Fr.* 8, 357), 199756 (*Fr.* 9, 793)M.L.B., *GP* 260662, 267546, (*Fr.* 11, 709, 709)Ciba, *USP* 899845, 902895Heller & Schülke, *Ber.* **41** (1908), 3632Böhn, *Ber.* **43** (1910), 1001Hepp, Uhlenhuth & Römer, *Ber.* **46** (1913), 709Ullmann & Klingenberg, *Ber.* **46** (1913), 712Ullmann & Dasgupta, *Ber.* **47** (1914), 560Scholl, *Mhft. Chem.* **32**, 997Eckert, *Mhft. Chem.* **35**, 300

Barnett, 94

Fierz-David, 618

Thorpe, **1**, 419**59000★ Pigment**

Condense phthalic anhydride with naphthalene in presence of aluminium chloride and ring close the product in presence of sulfuric acid

Soluble in acetone, benzene, chloroform, glacial acetic acid, toluene, xylene

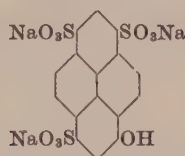
Slightly soluble in alcohol

Insoluble in petroleum ether

Discoverers — K. Elbs 1886; A. Lüttringhaus (use as lakes) 1908

Sirius Yellow G (B)Pigment of good fastness to water and moderate fastness to oil. Darkens on exposure to light (*C.I. 1094 (1st Edn.)* — unconfirmed)Heller, *GP* 193961 (*Fr.* 9, 669)Badische Co., *BP* 18616/08; *USP* 968376; *FP* 400632; *GP* 229401, 229643, (*Fr.* 10, 772, 773)Elbs, *Ber.* **19** (1886), 2209Gabriel & Colman, *Ber.* **33** (1900), 446Pickles & Weismann, *Proc. Chem. Soc.* **20** (1904), 201Graebe, *Ann.* **340** (1905), 249Heller & Schülke, *Ber.* **41** (1908), 3633Scholl, *Ber.* **44** (1911), 2992Scholl & Seer, *Ann.* **394** (1912), 119Barnett & Matthews, *Chem. News*, **130** (1924), 339

Barnett, 142

59040 C.I. Solvent Green 7 (Yellowish green)Classical name **Pyranine**

Reflux 1,3,6,8-pyrenetetrasulfonic acid with 15–20% caustic soda. Aqueous ammonia may be used for the hydrolysis, in which case the product contains also 8-amino-1,3,6-pyrenetrisulfonic acid

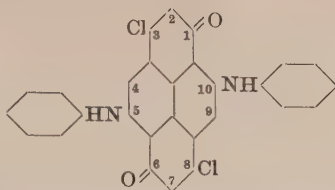
Discoverers — Tietze and Bayer 1939

Tietze & Bayer, *Annalen*, **540** (1939), 205

Federal Security Agency, Food and Drug Administration, Coal-tar Color Regulations (1940)

Slightly soluble in glacial acetic, hydrochloric acid (30%)

Insoluble in acetic acid, hydrochloric acid (10%)

59050 Vat Dye (Green)

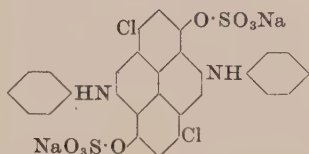
Oxidise hexachloropyrene with nitric acid to form 3,5,8,10-tetrachloro-1,6-pyrenedione and condense with aniline

Note — Parent compound for the preparation of **C.I.59051**

Discoverers — H. Vollman, H. Becker, and I.G. 1933
I.G., *BP* 434027; *USP* 2063568; *GP* 624168 (*Fr.* 22, 1165)
BIOS 1493, 64
Vollmann, Becker, Corell & Streeck, *Ann.* **531** (1937), 131
Holbro, *J. Appl. Chem.* **3** (1953), 3

59051 C.I. Solubilised Vat Green 21 (Green)

Leuco sulfuric ester of **C.I.59050**



Prepare by general methods — see below

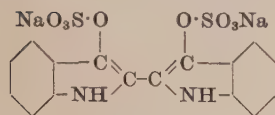
Discoverers and references —

General — see below

Additional — *FIAT* 764 — Anthrasolgruen I3G

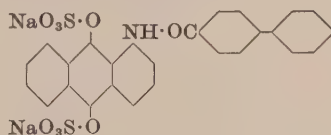
59051A**THE PREPARATION OF SOLUBILISED VAT DYES**

Typical formulae for indigoid and anthraquinonoid dyes —



Indigolol O

(**C.I. 73002**)



(**C.I.60531**)

Preparation (General methods)

(a) Treat the leuco vat dye with chlorosulfonic acid in the presence of pyridine

(b) Treat the vat dye in pyridine with a metal, e.g., copper, iron, or zinc, and a source of SO_3 , e.g., sulfur trioxide, chlorosulfonic acid or methyl chlorosulfonate

In both cases add to alkali, filter off the insoluble products, remove pyridine and salt out

Preparation (Modified process — applicable to special cases only)

(c) Convert acetamidoanthraquinones to their leuco disulfuric esters by one of the general methods before condensation. Hydrolyse, oxidise in alkali solution and salt out

General Note — The products have been prepared in various forms as e.g., sodium, potassium, lithium, calcium or ethanolamine salts

Discoverers — M. Bader and C. Sunder 1921

J. Morton, J. I. M. Jones, B. Wylam, J. E. G. Harris, and J. Wilson 1924

Durand & Huguenin, *BP* 186057, 202630, 202632, 231889, 237295, 260303, 267952, 401137, 422549, 537592, 607219; *USP* 1448251, 1639206, 1646925, 1668392; *Aust.P.* 101301; *Canad.P.* 229701; *FP* 551666, 571246, 754235; *GP* 424981, 428241, 430548, 435787, 436176, (*Fr.* 15, 592, 596, 594, —, 594), 474036, 481599, (*Fr.* 16, 1106, 1105), 579327, 580534, (*Fr.* 19, 2202, 2203)

Morton Sundour, *BP* 245587, 247787, 248802, 251491, 278399

Scottish Dyes, *BP* 258626, 260647, 261139, 263898, 271533, 271537, 274156, 274303, 277398, 288673, 290690, 306573, 309970, 312093, 317736, 332907, 333146, 334902, 334921, 359889, 363668, 363669; *GP* 547083 (*Fr.* 17, 1158), 563958, 567081, (*Fr.* 18, 1513, 1526), 574190 (*Fr.* 19, 2037)

Libmann, *FP* 637833

I.G., *BP* 247211, 267952, 272924, 299899, 304436, 310437, 324119, 330579, 356805, 390081, 407702, 416939, 428701, 461430; *FP* 609494, 764012, 779890; *GP* 438225, 445566, (*Fr.* 15, 982, 597), 461500, 470809, 476811, (*Fr.* 16, 1011, 1316, 1317), 580013, 584718, (*Fr.* 20, 1377, 1379)

Marschalk, *BP* 271569

Gen. Anil., *USP* 1903870, 1903871, 2307893, 2507944

Du Pont, *USP* 1954702, 2188320, 2200480, 2245535

Bretagne, *USP* 2344389

Ciba, *BP* 291768

Cyanamid, *BP* 585106; *USP* 2396582, 2402647, 2403226

Etab. Kuhlmann, *BP* 577167; *FP* 601632

I.C.I., *BP* 605617, 610117, 630459, 633480, 633481, 633483, 633484, 633485, 633486, 633487, 633492, 633493, 633498, 633499, 633501, 633502, 633513, 673541; *USP* 2504806

BIOS 960, 1; *BIOS* 1493, 60

FIAT 1313, 2, 188

Bader, *Chim. et Ind.* (1924), 449; *Chem. Ztg.* **61** (1937), 633, 741

Bader & Vaucher, *Chim. et Ind.* (1924), 455

Beil, *Z. angew. Chem.* **37** (1924), 745

Friedländer, *Melliand*, **6** (1925), 916
Sunder, *Chim. et Ind.* **21** (1929) (2), 491
Thorpe, **1**, 428
Diserens, 175
Venkataraman, 1046

The above notes and references apply to the following dyes —

| | | | | | | |
|-------|-------|-------|-------|-------|-------|-------|
| 56006 | 59711 | 61726 | 69816 | 73046 | 73386 | 73676 |
| 59051 | 59826 | 61736 | 69826 | 73056 | 73396 | 73801 |
| 59101 | 59831 | 66706 | 70306 | 73066 | 73401 | 73821 |
| 59106 | 59836 | 67001 | 70331 | 73071 | 73406 | 73831 |
| 59121 | 60006 | 67301 | 70601 | 73076 | 73411 | 73836 |
| 59301 | 60011 | 69016 | 70801 | 73336 | 73421 | 73861 |
| 59316 | 60531 | 69501 | 71001 | 73356 | 73596 | |
| 59321 | 60600 | 69511 | 73002 | 73361 | 73601 | |
| 59701 | 60605 | 69526 | 73031 | 73366 | 73661 | |
| 59706 | 60610 | 69801 | 73041 | 73381 | 73671 | |

59075 C.I. Solvent Green 5 (Dull olive)

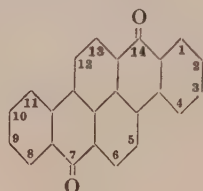
Discoverer — I.G.

BIOS 987, 174, 187



Heat 3,9-perylenedicarboxylic acid with phosphorus pentachloride in nitrobenzene and condense with isobutyl alcohol

Note — Some 3,10-isomer is also present

59100 C.I. Vat Yellow 4 (Reddish yellow)

(a) Ring close 3-benzoylbenzanthrone with aluminium chloride and an oxidising agent

(b) Ring close 1,5-dibenzoylnaphthalene in the presence of sodium and aluminium chlorides

Discoverers — G. Kränzlein, M. Corell, and R. Sedlmayer 1922
M.L.B., BP 205502, 220304, 222125, 246683; USP 1564584;
GP 412053, 423283, 423720, 426710, (Fr. 15, 731, 732, 733, 736)

I.G., BP 293768; USP 1874547; GP 518316 (Fr. 17, 1301), 576253
Ciba, BP 501897; USP 2238180

BIOS 987, 115; FIAT 1313, 2, 121, 123

FIAT 764 — Indanthrengoldgelb GK

Scholl & Neumann, Ber. 55 (1922), 118

Moschtschinskaja, J. Gen. Chem. (U.S.S.R.), 9 (1939), 1376

Bradley, JSDC, 63 (1942), 2

Schultz, Suppl. 1, 47

Fierz-David, Suppl. 98

Thorpe, 1, 426

Venkataraman, 953

Soluble in nitrobenzene, tetrahydronaphthalene, xylene
Slightly soluble in acetone, alcohol, benzene, chloroform, o-chlorophenol, pyridine, toluene

H₂SO₄ conc. — reddish violet; on dilution — orange ppt.

Na₂S₂O₄, alkaline — bordeaux; acid — golden yellow

59101 C.I. Solubilised Vat Yellow 4 (Reddish yellow)

Leuco sulfuric ester of C.I.59100

Prepare by general methods — see C.I.59051A

Discoverers and references —

General — see C.I.59051A

Additional —

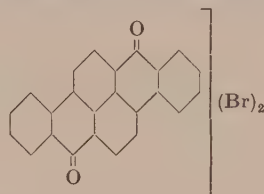
BIOS 960, 17

FIAT 764 — Anthrasolgoldgelb IKG

Soluble in acetone

Slightly soluble in alcohol

H₂SO₄ conc. — greenish brown; on dilution — golden yellow

59105 C.I. Vat Orange 1 (Bright yellowish orange)

Brominate C.I.59100 until the bromine content is approx. 28%

Discoverers — G. Kränzlein, R. Sedlmayer, H. Vollmann, and M. Corell 1924

I.G., BP 310891; USP 1856710; GP 430556 (Fr. 15, 738), 559354, 561441, 562209, 563199, 565341, 565342, 566796 (Fr. 18, 1332-47), 742811 (Fr.-Bayer, I-2, 619)

BIOS 987, 117, 119; BIOS-MISC 55, 14, App. 3 and 4

FIAT 1313, 2, 121, 128

FIAT 764 — Indanthrengoldgelb RK

Kunz, Bull. Soc. ind. Mulhouse, 3 (1934); Z. angew. Chem., 52 (1939), 269

Fierz-David, Suppl. 99

Soluble in nitrobenzene, tetrahydronaphthalene, xylene
Slightly soluble in acetone, alcohol, benzene, chloroform, o-chlorophenol, pyridine, toluene

H₂SO₄ conc. — bright bluish violet; on dilution — orange

Na₂S₂O₄, alkaline — bordeaux; acid — orange

59106 C.I. Solubilised Vat Orange 1 (Yellowish orange)

Leuco sulfuric ester of C.I.59105

Prepare by general methods — see C.I.59051A

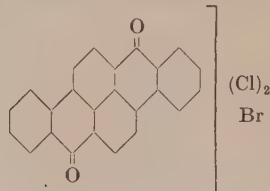
Discoverers and references —

General — see C.I.59051A

Additional —

BIOS 960, 19

FIAT 764 — Anthrasolgoldgelb IRK

59110 C.I. Vat Yellow 44 (Reddish yellow)

Chlorinate and then brominate C.I.59100 in presence of iodine

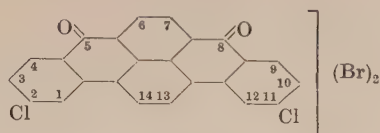
Discoverers — G. Kränzlein, H. Vollmann, and M. Corell 1928

Tendering on exposure to light accelerated

I.G., BP 338747; USP 1901307; GP 562209 (Fr. 18, 1332)

BIOS 1493, 38; FIAT 764 — Indanthrendruckgelb GOW

Na₂S₂O₄, alkaline — bordeaux; acid — yellow

59115 **Vat Dye (Yellowish red)**

Introduce 2 bromine atoms into 2,11-dichlorodibenzo[*a,i*]pyrene-5,8-dione

Discoverers — G. Kränzlein, H. Vollmann, H. Becker, and I.G. 1927

Indanthren Scarlet 4G (IG)

Application method A/Q2

Fastness Properties (C): Chlorine 4–5, Light 5, 6–7, 7, Soda boil 3–4

I.G., BP 287845, 293768, 339489; USP 1874547, 1948926; GP 514974, 518316, 544998, (Fr. 17, 1250, 1301, 1253)

FDX 885 (PB 74735, fr. 1068) — Indanthrenscharlach 4G

Na₂S₂O₄, alkaline — rubine

59120 **Vat Dye (Yellowish red)**

The tetrachloro compound analogous to C.I.59115

Discoverer — I.G.

Indanthren Scarlet 4G new (IG)

Application method A/Q2

Fastness Properties (C): Chlorine 4–5, Light 5, 6–7, 7, Soda boil 3–4

59121 **Solubilised Vat Dye (Reddish orange)**

Leuco sulfuric ester of C.I.59120

Prepare by general methods — see C.I.59051A

Discoverers and references —

General — see C.I.59051A

Additional — FDX 885 (PB 74735) — Indigosolorange IRR

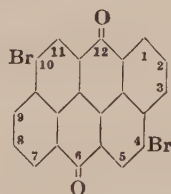
Indigosol Orange IRR (IG)**59270** **C.I. Vat Brown 39 (Reddish brown)**

Condense the monobromo derivative of C.I.59100 with 1-amino-2-anthraquinonecarboxaldehyde

Discoverer — I.G.

FDX 885 (PB 74735) — Indanthrenrotbraun G

Na₂S₂O₄, alkaline — violet; acid — reddish brown

59300 **C.I. Vat Orange 3 (Bright reddish orange)****C.I. Pigment Red 168 (Bright yellowish red)**

(a) Brominate anthanthrone

(b) Ring close [1,1'-binaphthalene]-8,8'-dicarboxylic acid in sulfuric acid and brominate

(c) Bromination may precede ring closure in (b) above

Discoverer — L. Kalb 1913

Cassella Co., BP 260998, 280217; GP 458598 (Fr. 16, 1410)

I.G., BP 288957; GP 470947, 478738, 492344, 495367, (Fr. 16, 1415, 1417, 1412, 1414)

BIOS 987, 129; FIAT 1313, 2, 88, 90, 193

FIAT 764 — Indanthrenbrillantorange RK

Kalb, Ber. 47 (1914), 1724

Maki & Hashimoto, Bull. Chem. Soc. Jap. 26 (1953), 348 (JSDC, 70 (1954), 29)

Bradley & Waller, JCS (1953), 3783

Fierz-David, Suppl. 98

Thorpe, 1, 426

Soluble in tetrahydronaphthalene, xylene

Slightly soluble in chloroform (hot), *o*-chlorophenol, pyridine

Insoluble in acetone, alcohol, toluene

H₂SO₄ conc. — dull green; on dilution — orange

Na₂S₂O₄, alkaline — reddish violet; acid — orange

59301 **C.I. Solubilised Vat Orange 3 (Bright reddish orange)**

Disodium or aliphatic amine salt of the leuco sulfuric ester of C.I.59300

Prepare by general methods — see C.I.59051A

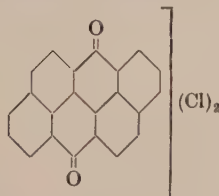
Discoverers and references —

General — see C.I.59051A

Additional —

I.G., BP 428701; GP 617727 (Fr. 22, 793)

BIOS 1493, 62; FIAT 764 — Anthrasolbrillantorange IRK

59305 **C.I. Vat Orange 19 (Bright orange)**

Chlorinate anthanthrone

Discoverers — R. Herz and W. Zerweck 1925

Cassella Co., BP 260998, 280217; GP 458598 (Fr. 16, 1410)

I.G., BP 288957; GP 492344, 495367, (Fr. 16, 1412, 1414)

FIAT 1313, 2, 89, 96; FIAT 764 — Indanthrenbrillantorange GK

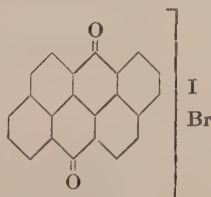
Fierz-David, Suppl. 98

Thorpe, 1, 426

Slightly soluble in tetrahydronaphthalene, xylene

H₂SO₄ conc. — green

Na₂S₂O₄, alkaline — reddish violet; acid — orange

59310 **Vat Dye (Main component of C.I. Vat Red 37)**

Treat dibromoanthanthrone (C.I.59300) with iodine and arsenic pentoxide

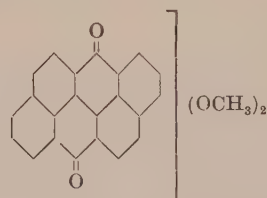
Discoverer — I.G.

Indanthren Scarlet RM (IG)

Used only in mixtures. See C.I. Vat Red 37

BIOS 987, 131 (Indanthren Scarlet RM)

FIAT 1313, 2, 95 (Vat Scarlet RM)

59315 Vat Dye

Ring close a dimethoxy[1,1'-binaphthalene]-8,8'-dicarboxylic acid

Note — Parent compound [Vat Red Violet (CFM)] for the preparation of **C.I.59316**

59316 C.I. Solubilised Vat Violet 6 (Reddish violet)

Leuco sulfuric ester of **C.I.59315**

Prepare by general methods — see **C.I.59051A**

Discoverer — I.G. 1926

Spinning Violet 3BV (IG) — For incorporation in viscose melt before spinning

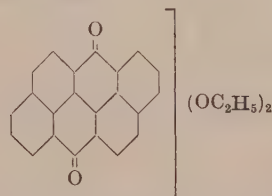
I.G., GP 507338 (Fr. 17, 1246)

FIAT 1313, 3, 379

Discoverers and references —

General — see **C.I.59051A**

Additional — FDX 885 (PB 82175) — Anthrasolrotviolett IRR

59320 Vat Dye (Violet)

Ring close a diethoxy[1,1'-binaphthalene]-8,8'-dicarboxylic acid

Note — Parent compound [Vat Purple (CFM)] for the preparation of **C.I.59321**

Discoverer — I.G. 1926

I.G., GP 507338 (Fr. 17, 1246)

59321 C.I. Solubilised Vat Violet 7 (Violet)

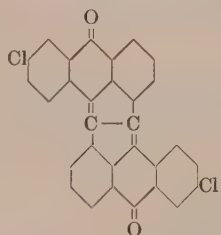
Leuco sulfuric ester of **C.I.59320**

Prepare by general methods — see **C.I.59051A**

Discoverers and references —

General — see **C.I.59051A**

Additional — FDX 885 (PB 82175) — Anthrasolviolett I5R

59500 C.I. Vat Brown 45 (Reddish brown)

Treat 2-chloroanthrone with glyoxal sulfate, fuse with alcoholic potash and treat with sulfuric acid

Discoverer — I.G. 1930

I.G., GP Appln. 221119/1930

BIOS 987, 127; BIOS 1493, 47; FIAT 1313, 2, 148

FIAT 764 — Indanthrenrotbraun RR

Venkataraman, 985

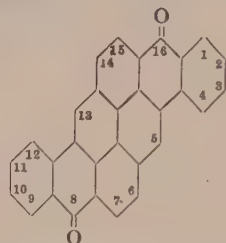
H₂SO₄ conc. — reddish blue

Na₂S₂O₄, alkaline — yellowish brown; acid — yellowish brown

59700 C.I. Vat Orange 9 (Yellowish orange)

C.I. Pigment Orange 40 (Yellowish orange)

Classical name **Pyranthrone**



(a) Eliminate 2 mol. water from 2,2'-dimethyl-1,1'-bianthraquinone by heating alone at 350–380°C or with dehydrating agents at lower temperatures

(b) Heat an aqueous paste of 2,2'-dimethyl-1,1'-bianthraquinone, with or without the addition of ammonia or salts, at 230–250°C under pressure for 10–12 hrs.

(c) Heat 2,2'-dimethyl-1,1'-bianthraquinone with alcoholic caustic potash

(d) Fuse 1,6-dibenzoylpyrene with aluminium chloride and sodium chloride and pass in oxygen

Discoverer — R. H. Scholl 1905

Badische Co., BP 14578/05, 10505/06, 16271/10, 24486/10, 20664/13; USP 828778, 845129, 856811, 1004433; FP 357239, 418435; GP 174494, 175067, 180157, (Fr. 8, 359, 356, 355), 212019 (Fr. 9, 797), 238980, 239671, (Fr. 10, 688, 682), 287270 (Fr. 12, 431)

Ciba, FP 398015; GP 205218 (Fr. 9, 809)

I.G., BP 331842

BIOS 987, 60; FIAT 1313, 2, 113, 114

FIAT 764 — Indanthrengoldorange G

Scholl, Ber. 40 (1907), 1693; 43 (1910), 346, 513; 44 (1911), 1448, 1662; 51 (1918), 441

Scholl, Potschiwauischeg & Linko, Mhft. Chem. 32 (1911), 687

Scholl & Seer, Ann. 394 (1912), 111; Mhft. Chem. 33 (1912), 1

Scholl & v. Seybel, Ann. 394 (1912), 143

Scholl & Tänzer, Ann. 443 (1923), 163

Kränzlein, Z. angew. Chem. 51 (1938), 373

Beilstein, 7 (1925), 851

Vollman, Becker, Corell & Streeck, Ann. 531 (1937) (1), 119

Scholl, Meyer & Donat, Ber. 70 (1937), 2180, 2185, 2189

Appleton & Geake, Trans. Far. Soc. 37 (1941), 45

Truttwin, 503

Barnett, 335

Fierz-David, 612

Houben, 735, 749, 762

Fierz-David & Blangey, 223

H₂SO₄ conc. — dull blue; on dilution — yellowish brown ppt.

Na₂S₂O₄, alkaline — bluish red; acid — orange

Soluble in tetrahydronaphthalene, xylene

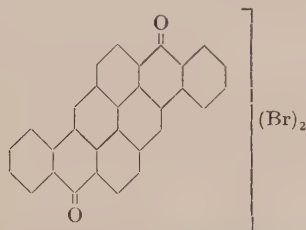
Slightly soluble in alcohol

59701 C.I. Solubilised Vat Orange 9 (Yellowish orange)

Leuco sulfuric ester of C.I. 59700

Prepare by general methods—see C.I. 59051A

Discoverers and references—General—see C.I. 59051A

59705 C.I. Vat Orange 2 (Reddish orange)

Brominate pyranthrone in chlorosulfonic acid

Note—In *FIAT* 1313 the two Br atoms are shown in positions 4 and 12

Discoverer and references as C.I.59700

Additional references—

Badische Co., *GP* 186596 (*Fr.* 9, 798)*BIOS* 987, 4, 61; *FIAT* 1313, 2, 113, 116*FIAT* 764—Indanthrenorange RRT

Soluble in tetrahydronaphthalene, xylene (yellow with green fluorescence)

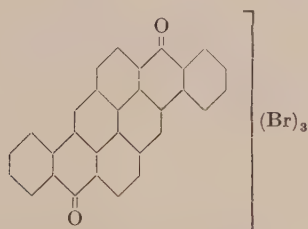
 H_2SO_4 conc. — blue; on dilution — yellow $\text{Na}_2\text{S}_2\text{O}_4$, alkaline — reddish violet; acid — orange**59706 C.I. Solubilised Vat Orange 2 (Bright reddish orange)**

Leuco sulfuric ester of C.I.59705

Prepare by general methods—see C.I.59051A

Discoverers and references—

General—see C.I.59051A

59710 C.I. Vat Orange 4 (Reddish orange)

(a) Brominate pyranthrone in nitrobenzene or chlorosulfonic acid

(b) Eliminate water from a bromo-2,2'-dimethyl-1,1'-bianthraquinone

Note—In *FIAT* 1313 the three Br atoms are shown in positions 1, 4 and 12

Discoverers—R. H. Scholl and M. H. Isler 1909

Badische Co., *BP* 10412/08, 12568/09; *USP* 876810, 929442, 955105; *FP* 357239; *GP* 175067 (*Fr.* 8, 356), 186596, 211927, 218162, (*Fr.* 9, 798, 796, 799)Brit. Dye. Corp., *BP* 282481*BIOS* 987, 4, 62; *FIAT* 1313, 2, 113, 116*FIAT* 764—Indanthrenorange 4RHeller-Schülke, *Ber.* 41 (1908), 3627Scholl, *Mhft. Chem.* 39 (1918), 231Fraser-Thomson, *JSDC*, 52 (1936), 240

Barnett, 335

Thorpe, 1, 419

Soluble in tetrahydronaphthalene, xylene (yellow with green fluorescence)

Insoluble in alcohol

 H_2SO_4 conc. — blue; on dilution — orange ppt. $\text{Na}_2\text{S}_2\text{O}_4$, alkaline — violet; acid — orange**59711 C.I. Solubilised Vat Orange 4 (Reddish orange)**

Leuco sulfuric ester of C.I.59710

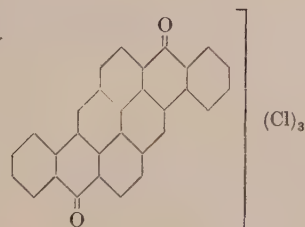
Prepare by general methods—see C.I.59051A

Discoverers and references—

General—see C.I.59051A

59715★ Vat Dye (Orange)

Probably



(a) Dissolve pyranthrone in conc. sulfuric acid. Pass chlorine through the solution in the presence of iodine until the dye formed becomes no redder in shade

(b) Treat pyranthrone under pressure with sulfuryl chloride in presence of nitrobenzene and iodine

Discoverer—M. H. Isler 1909

Indanthren Golden Orange R (B)

Fastness Properties: Light, good (*C.I.1097* (1st Edn.)—unconfirmed)Badische Co., *BP* 10412/08, 12568/09; *USP* 876810, 929442, 955105; *FP* 357239; *GP* 175067 (*Fr.* 8, 356), 186596, 211927, 218162, (*Fr.* 9, 798, 796, 799)Scholl, *Ber.* 43 (1910), 352; *Mhft. Chem.* 39 (1918), 231Heller-Schülke, *Ber.* 41 (1909), 3627

Houben, 767

Soluble in xylene

 H_2SO_4 conc. — deep blue; on dilution — orange ppt. $\text{Na}_2\text{S}_2\text{O}_4$, alkaline — cherry red; acid — reddish orange

59800 C.I. Vat Blue 20 (Dull bluish violet → Reddish navy)
C.I. Pigment Blue 65 (Reddish blue)

Classical name **Violanthrone**



- (a) Condense 9-anthrol with glycerol in presence of sulfuric acid and fuse the benzanthrone so formed with potassium hydroxide
- (b) Heat 4,4'-dibenzoyl-1,1'-binaphthyl with aluminium chloride
- (c) Fuse benzanthrone with caustic potash in the presence of glucose and an inert high-boiling solvent

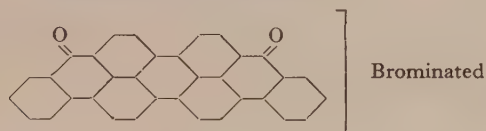
Fierz-David, 615 and Suppl. 90
Houben, 736, 774, 783, 784
Mayer, 185
Venkataraman, 962

Soluble in tetrahydronaphthalene, xylene (red soln. with red fluorescence)
Slightly soluble in acetone, chloroform, *o*-chlorophenol, pyridine, toluene
Insoluble in alcohol
H₂SO₄ conc. — violet black; on dilution — violet black ppt.
Na₂S₂O₄, alkaline — dull violet; acid — dull red

Discoverers — O. Bally and M. H. Isler 1904

Badische Co., BP 16538/04, 22519/05, 12818/13, 203533, 247261;
USP 787859, 809892, 809894, 811471, 818336, 818992,
1564423, 1580062; FP 349531, 451798, 589323; SwissP
112399; GP 172609, 176018, 181176 (Fr. 8, 371, 372, 376),
185221, 187495, 188193, 193959, 200335, 204354, 205294,
(Fr. 9, 824, 816, 828, 821, 817, 818, 820), 275537, 290079,
(Fr. 12, 483, 481), 409689, 416028, (Fr. 15, 751, 746)
Bayer Co., GP 201542 (Fr. 9, 682)
Scholl, BP 16271/10; FP 418435; GP 239671 (Fr. 10, 682),
407838 (Fr. 14, 892)
Perkin, BP 126765
National Aniline, BP 183419; USP 1478027, 1583258
I.G., BP 245165, 278047, 303538; GP 438467 (Fr. 15, 750),
497736, 503812, (Fr. 17, 1331, 1503)
Scottish Dyes, BP 251313, 274156, 278112, 301403, 312093, 339324
Brit. Aliz., BP 281016, 284035
Du Pont, BP 430665; USP 2013791, 2022884
BIOS 987, 75; BIOS-MISC 55, 15; FIAT 1313, 2, 108
Liebermann & Gimpel, Ber. 20 (1887), 1854
Bally, Ber. 38 (1905), 195
Brown, JSDC, 22 (1906), 11
Bohn, Chem. Ztg. 32 (1908), 809
Scholl, Ber. 43 (1910), 2208; Ann. 394 (1912), 143
Scholl & Bally, Ber. 44 (1911), 1656
Scholl & Seer, Ann. 394 (1912), 129; 398 (1913), 82
Rowe & Bryans, JSCI, 46 (1927), 335T
Schwenk, Chem. Ztg. 52 (1928), 62
Lüttringhaus & Neresheimer, Ann. 473 (1929), 259
Maki and others, JSCI, Jap. 36 (1933) Suppl. 529B; 37 (1934)
Suppl. 213B, 750B; 38 (1935) Suppl. 487
Bradley & Jadhav, JCS (1948), 1622
Fraser-Thomson, JSDC, 52 (1936), 250

59805 C.I. Vat Blue 19 (Reddish navy)



Brominate violanthrone in nitrobenzene or chlorosulfonic acid in the presence of fuming sulfuric acid and sulfur

Note — The product has been stated to be a dibrominated violanthrone containing 6% sulfur¹

If the bromination is carried out in the presence of antimony Indanthren Navy Blue BRF is obtained. This dye has been claimed to contain bromo-, dibromo- and tribromoviolanthrone²

Discoverer — I.G.

I.G., BP 445355
BIOS 987, 6, 75; FIAT 764 — Indanthrenmarineblau BF
¹ FDX 885 (PB 74778) — Indanthrenmarineblau BF
² Maki & Kikuchi, JSCI, Jap. 50 (1947), 141 (CA, 44 (1950), 9151)

Na₂S₂O₄, alkaline — bluish violet; acid — reddish brown

59810 Vat Dye



(a) Chlorinate a suspension of violanthrone in nitrobenzene, glacial acetic acid or chlorosulfonic acid at 60–70°C with sulfuryl chloride or chlorine

(b) Treat violanthrone with ferric chloride at 140°C in presence of trichlorobenzene

(c) Treat violanthrone with chlorosulfonic acid, oleum and sulfur

H₂SO₄ conc. — dull violet; on dilution — dull violet ppt.
Na₂S₂O₄, alkaline — blue (brown fluorescence); acid — crimson

Discoverer — O. Bally 1905

Indanthren Violet RT (B)

Fastness Properties: Chlorine, good; Light, good–very good
(C.I.1100 (1st Edn.) — unconfirmed)
Badische Co., BP 22519/05, 212145; USP 837775, 1562468,
1589303; FP 349531, 566112; GP 177574 (Fr. 8, 375), 193959
(Fr. 9, 821), 402640 (Fr. 14, 894)
Brit. Aliz., BP 253163, 345623
Ciba, BP 262774, 294486; USP 1771802; SwissP 127715;
GP 465988 (Fr. 16, 1482)
Scottish Dyes, BP 278834
I.G., BP 445355
Formánek, Chem. Ztg. 41 (1917), 713
Maki & Aoyamá, JSCI, Jap. 37 (1934), 219B
Maki & Nagi, JSCI, Jap. 38 (1935), No. 9, 11

Soluble in benzene, xylene (reddish violet with yellow fluorescence)
Insoluble in alcohol, benzine

59815 C.I. Vat Blue 18 (Reddish blue → Reddish navy)



Chlorinate violanthrone in a solvent to introduce at least three chlorine atoms

Discoverer — Brit. Aliz. 1925

Brit. Aliz., BP 253163, 345623

Soluble in acetone, nitrobenzene, tetrahydronaphthalene, xylene
Slightly soluble in benzene
Insoluble in alcohol
H₂SO₄ conc. — reddish violet; on dilution — bluish violet ppt.
Na₂S₂O₄, alkaline — greenish blue; acid — reddish violet

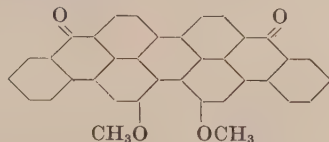
59820 C.I. Vat Blue 22 (Reddish blue → Reddish navy)

A tetrachloroviolanthrone



Chlorinate violanthrone in a solvent (phthalic anhydride or trichlorobenzene) at 140–145°C

Discoverer — I.G. 1934

I.G., *BP* 445355*BIOS* 1493, 27; *BIOS-MISC* 20, App. 41*FIAT* 764 — Indanthrenmarineblau RBFox, *JSDC*, **65** (1949), 520 $\text{Na}_2\text{S}_2\text{O}_4$, alkaline — blue; acid — violet**59825 C.I. Vat Green 1 (Bright green)**

- (a) Methylate the oxidation product of violanthrone in nitrobenzene
 (b) Fuse 2-methoxybenzanthrone with caustic potash
 (c) Oxidise benzanthrone with manganese dioxide in sulfuric acid; condense with alcoholic caustic potash and alkylate
 (d) Methylate 16,17-dihydroxyviolanthrone

Fierz-David, *Suppl.* 90, 92, 95Thorpe, **1**, 425

Venkataraman, 969

Soluble in tetrahydronaphthalene (warm)

Slightly soluble in acetone, *o*-chlorophenol, nitrobenzene, pyridine (hot)

Insoluble in alcohol, chloroform, toluene

 H_2SO_4 conc. — reddish violet; on dilution — green ppt. $\text{Na}_2\text{S}_2\text{O}_4$, alkaline — blue; acid — bright red

Discoverers — A. H. Davies, R. F. Thomson, and J. Thomas 1920

Scottish Dyes, *BP* 181304, 193431, 210703, 251313, 278112,288673; *USP* 1531261, 1531262, 1531263, 1607491, 1633997;*FP* 543910, 606296; *SwissP* 103218, 104710–2 105851;*GP* 416208, 417068, (*Fr.* **15**, 763, 760)I.G., *BP* 218255, 234173, 263861, 278651; *FP* 581915, 607135,636223; *SwissP* 118722; *GP* 413738, 414203, 414924, 436828,442511, 443610, 445729, (*Fr.* **15**, 765, 770, 771, 766, 772,772, 742), 485188, 491876, (*Fr.* **16**, 1487, 1115), 507559(*Fr.* **17**, 1347)Ciba, *BP* 311661Brit. Celanese, *BP* 341408Durand & Huguenin, *SwissP* 127948I.C.I. *BP* 405706Grasselli Chem., *USP* 1675014Du Pont, *USP* 1910603, 2042414*BIOS* 987, 69; *FIAT* 1313, 2, 81*FIAT* 764 — Indanthrenbrillantgruen FFBFraser-Thomson, *JSDC*, **42** (1926), 124; **52** (1936), 251; *JSCI*, **52**

(1933), 946, 1935

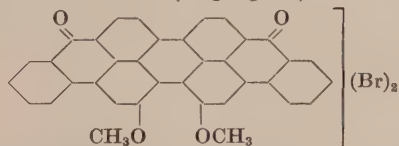
Marschalk, *Bull. Soc. chim.* **41** (1927), 706Fierz-David, *Bull. Soc. chim.* **41** (1927), 1549Maki, *JSCI, Jap.* **38** (1935) No. 11, *Suppl.* 630BMaki & Aoyama, *JSCI, Jap.* **38** (1935) No. 11, *Suppl.* 636BBaddar, *JCS*, (1948), 1088**59826 C.I. Solubilised Vat Green 1 (Green)**Leuco sulfuric ester of **C.I.59825**Prepare by general methods — see **C.I.59051A** H_2SO_4 conc. — dark brown; on dilution — red

Discoverers and references —

General — see **C.I.59051A**Additional — *BIOS* 960, 15; *FIAT* 764 — Anthrasolgruen IB

Soluble in acetone

Slightly soluble in alcohol

59830 C.I. Vat Green 2 (Bright green)Brominate **C.I.59825** in oleum in the presence of sodium nitrite, care being taken to avoid demethylation H_2SO_4 conc. — dull violet $\text{Na}_2\text{S}_2\text{O}_4$, alkaline — blue; acid — bluish red

Discoverer — P. Nawiaskey 1922

Badische Co., *BP* 181304, 205304; *GP* 417068, 436828, (*Fr.* **15**, 760, 766)I.G., *BP* 333762; *GP* 452449 (*Fr.* **17**, 1355)Newport Chem. Col. Wks., *BP* 354974Du Pont, *USP* 1905088, 2068350*BIOS* 987, 70*FIAT* 764 — Indanthrenbrillantgruen GGFraser-Thomson, *JSDC*, **52** (1936), 244, 251

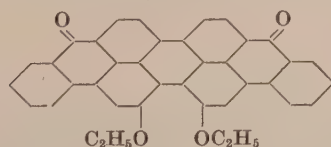
Soluble in tetrahydronaphthalene (green fluorescence)

Slightly soluble in *o*-chlorophenol

Insoluble in acetone, alcohol, chloroform, pyridine, toluene

59831 C.I. Solubilised Vat Green 2 (Bright green)Leuco sulfuric ester of **C.I.59830**Prepare by general methods — see **C.I.59051A**

Discoverers and references —

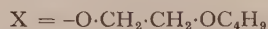
General — see **C.I.59051A****59835 C.I. Vat Green 4 (Bright bluish green)**Prepare as **C.I.59825** using ethylated compounds in place of methylated compounds

Discoverer — Scottish Dyes 1921

Scottish Dyes, *BP* 193431, 210703; *GP* 417068 (*Fr.* **15**, 760)I.G., *GP* 485188 (*Fr.* **16**, 1487)*FIAT* 764 — Indanthrenbrillantgruen 3BFraser-Thomson, *JSDC*, **52** (1936), 244 H_2SO_4 conc. — bluish red $\text{Na}_2\text{S}_2\text{O}_4$, alkaline — blue; acid — bluish red**59836 C.I. Solubilised Vat Green 4 (Bright bluish green)**Leuco sulfuric ester of **C.I.59835**Prepare by general methods — see **C.I.59051A**

Discoverers and references —

General — see **C.I.59051A**

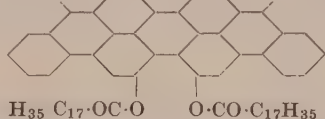
59840 Solvent Dye

Treat 16,17-dihydroxyviolanthrone with 2-butoxyethyl *p*-toluene-sulfonate

Discoverer — I.G.

Zapon Fast Green B (IG)

FDX 885 (PB 74725) — Zaponechtgrün B

59845 C.I. Solvent Green 6 (dull olive)

Treat leuco 16,17-dimethoxyviolanthrone with stearoyl chloride in the presence of pyridine and zinc dust

Discoverer — I.G.

O. Stallmann (1938) was the first to discover the correct constitution of this product

Du Pont, USP 2183628

I.G., USP 2135259; GP 701187 (Fr. 25, 788)

BIOS 987,186

Soluble in fats, oils, waxes and organic solvents
Insoluble in water

59850 C.I. Vat Green 9 (Dull green)*

Nitroviolanthrone

Possibly



X or Y = NO₂

Nitrate a suspension of violanthrone in glacial acetic acid or 40% chloroacetic acid

Note — The mononitroviolanthrone is reduced in the dye-liquor to give the amino compound which may be re-oxidised on the fibre to give a black. The amino compound may be oxidised in substance to give direct dyeing vat blacks irreducible to the green amino dyes

Discoverer — O. Bally 1904

Badische Co., BP 1818/05, 204241, 220212, 241437; USP 796393, 876679, 1513851, 1581638; FP 349531, 572971, 594792;

GP 185222, 226215, (Fr. 9, 830, 1200), 402641 (Fr. 15, 895)

Ciba, GP 448908 (Fr. 15, 759)

National Aniline, USP 1464598

I.G., BP 441886, 441919

BIOS 987, 75; FIAT 764 — Indanthrenschwarz BB

Maki, Nagai & Hayashi, JSCI, Jap. 38 (1935) No. 12, Suppl. 710B

Bennett, Pritchard & Simonsen, JCS (1943), 31

Malhotra, Unni and Venkataraman, J. Sci. Ind. Res. (India), 19B (1960), 382

Fierz-David, 615, Suppl. 94

Thorpe, 1, 424

Venkataraman, 965

Soluble in *o*-chlorophenol, tetrahydronaphthalene, xylene
Slightly soluble in acetone, chloroform, pyridine, toluene
Insoluble in alcohol

H₂SO₄ conc. — dull violet; on dilution — dull violet ppt.

HNO₃ conc. — green

Na₂S₂O₄, alkaline — violet; acid — dull red

* When oxidised — Bluish black

59855 C.I. Vat Black 16 (Bluish grey)

Treat violanthrone with hydroxylamine in concentrated sulfuric acid

Discoverer — Badische Co. 1922

Badische Co., BP 204241

BIOS-MISC 55, 19; FIAT 764 — Indanthrengrau 3B

Fox, JSDC, 65 (1949), 520

Soluble in pyridine (blue with brownish red fluorescence)

Insoluble in xylene

H₂SO₄ conc. — dull violet

Na₂S₂O₄, alkaline — reddish violet; acid — reddish brown

59856 C.I. Vat Blue 51

Treat violanthrone with half the quantity of hydroxylamine used in the preparation of C.I. 59855

Discoverer — I.G. 1939

Indanthren Grey 3G (IG)

I.G., BP 512189; GP 435477 (Fr. 15, 758)

BIOS 987, 6, 73; BIOS-MISC 20, App. 46

FIAT 764 — Indanthrengrau 3G

59860 Vat Dye (Greenish grey)

Nitrate 4,4'-dibenzanthronyl; reduce and fuse with alcoholic potash

60000 C.I. Vat Violet 10 (Bluish violet)Classical name **Isoviolanthrone**

(a) Chlorinate benzanthrone and treat with alcoholic potassium hydroxide

(b) Heat benzanthrone with alcoholic potassium hydroxide in xylene, chlorobenzene or kerosine

(c) Convert 3-chlorobenzanthrone into the corresponding sulfide or selenide and react with alkali

Soluble in *o*-chlorophenol, xylene (red fluorescence)

Slightly soluble in acetone, chloroform, pyridine, toluene

Insoluble in alcohol

 H_2SO_4 conc. — dull green; on dilution — violet ppt. $\text{Na}_2\text{S}_2\text{O}_4$, alkaline — dull reddish blue; acid — dull red

Discoverers — O. Bally and H. Wolff 1906

Badische Co., BP 20837/06, 242620, 247261, 255277; USP 906367, 1580062; FP 349531, 589323; GP 193959, 194252, (Fr. 9, 821, 826), 409689 (Fr. 15, 751), 416028 (Fr. 15, 746)

I.G., BP 261888, 262030, 303123; FP 606385, 656886; GP 431775, 436077, 436533, 441465, 442415, 448262, (Fr. 15, 745, 785, 744, 729, 726, 728), 470500 (Fr. 16, 1475), 497578 (Fr. 17, 1332)

Brit. Aliz., BP 275283, 281016

Scottish Dyes, BP 303454

Du Pont, BP 370905; USP 1954482, 1965855, 1977242, 1999996, 1999997, 1999999, 2153312

Cyanamid, USP 2468606

I.C.I., BP 367462

Zinke, Linner & Wolfbauer, Ber. 58 (1925), 323

Zinke, Funke & Pongratz, Ber. 58 (1925), 330, 799

Zinke & Funke, Ber. 58 (1925), 2222

Marschalk, Bull. Soc. chim. 41 (4), 706

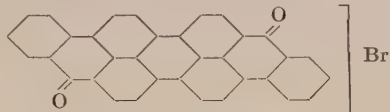
Maki & Nagai, JSCI, Jap. 37 (1934), No. 4, Suppl. 213B; 38 (1935), No. 10, Suppl. 560B

Nagai, JSCI, Jap. 45 (1942), Suppl. 149

Barnett, 331

Fierz-David, 616

Venkataraman, 975

60005 C.I. Vat Violet 9 (Bright bluish violet)**C.I. Pigment Violet 33 (Bluish violet)**Brominate a suspension of **C.I.60000** in nitrobenzene or chloro-sulfonic acid*Note* — The degree of bromination varies, the bluer tones being obtained from the more highly brominated products

Slightly soluble in tetrahydronaphthalene, xylene

 H_2SO_4 , conc. — green; on dilution — dull violet ppt. $\text{Na}_2\text{S}_2\text{O}_4$, alkaline — blue; acid — dull bluish red

Discoverers — R. Just and H. Wolff 1909

General references —

Badische Co., BP 7931/09, 17271/12, 242620; USP 1003268, 1150863; FP 349531; GP 194252, 217570, (Fr. 9, 826, 827), 260428 (Fr. 11, 726)

Morton Sundour Fabrics, BP 209569

I.G., BP 257618, 259608, 262030, 263200, 293795, 315276, 325525, 336775; USP 1646235, 1736081, 1766413, 1821023; FP 656886, 677244; GP 436533, 441748, 443022, 448262, (Fr. 15, 744, 723, 724, 728), 453134 (Fr. 16, 1477)

Du Pont, BP 435321; USP 1525117

Ciba, GP 465988, 480487, (Fr. 16, 1482, 1482)

Zinke, Funke & Pongratz, Ber. 58 (1925), 799

Maki & Nagai, JSCI, Jap. 38 (1935), No. 11 Suppl. 636B

Fierz-David, Suppl. 94

Thorpe, 1, 424

Additional references —

BIOS 1493, 9; FIAT 1313, 2, 170

FIAT 764 — Indanthrenbrillantviolett 3B

60006 Solubilised Vat Dye (Bright bluish violet)Leuco sulfuric ester of **C.I.60005**Prepare by general methods — see **C.I.59051A**

Discoverers and references —

General — see **C.I.59051A****Indigosol Brilliant Violet I3B (IG)****60010 C.I. Vat Violet 1 (Bright bluish violet)****C.I. Pigment Violet 31 (Bluish violet)**(a) Chlorinate purified **C.I.60000** in nitrobenzene

(b) Treat dichlorobenzanthrone with alkali

Discoverers — R. Just and H. Wolff 1909

General references as for **C.I.60005**

Additional reference —

FIAT 764 — Indanthrenbrillantviolett RR, 4R

Soluble in benzene

Slightly soluble in chloroform, *o*-chlorophenol, nitrobenzene, pyridine, tetrahydronaphthalene, toluene, xylene

Insoluble in acetone (purified colour), alcohol

 H_2SO_4 conc. — green; on dilution — violet ppt. $\text{Na}_2\text{S}_2\text{O}_4$, alkaline — blue; acid — reddish violet**60011 C.I. Solubilised Vat Violet 1 (Bright bluish violet)**Leuco sulfuric ester of **C.I.60010**Prepare by general methods — see **C.I.59051A**

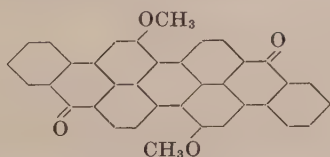
Discoverers and references —

General — see **C.I.59051A**

Additional —

BIOS 1493, 63

FIAT 764 — Anthrasolbrillantviolett I4R

60015 C.I. Vat Blue 26 (Greenish blue)

Oxidise isoviolanthrone and methylate

Discoverer — I.C.I. 1938

I.C.I., BP 193431

I.G., GP 442511 (Fr. 15, 772), 468957 (Fr. 16, 1489), 644583 (Fr. 23, 1055)

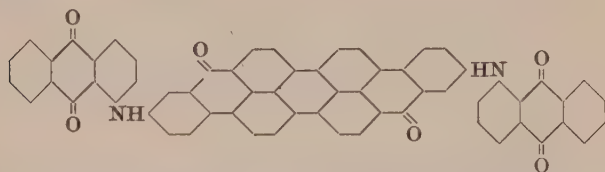
Du Pont, USP 1633997

BIOS-MISC 20, App. 47; FIAT 764 — Algolreinblau B

Geake, Trans. Far. Soc. 37 (1941), 68

Fox, JSDC, 65 (1949), 520

 $\text{Na}_2\text{S}_2\text{O}_4$, alkaline — blue; acid — violet

60020 **Vat Dye**

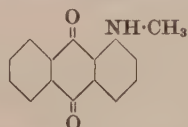
Discoverer — I.G.

Indanthren Grey A (IG)

FDX 885 (PB 74778) — Indanthrengrau A

Condense bis(9-bromo-3-benzanthronyl) sulfide with 2 mol. 1-aminoanthraquinone and fuse with caustic potash

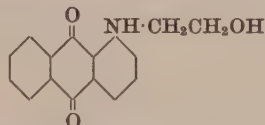
1-Aminoanthraquinone, formerly employed as a smoke dye, appears in the Developing Component section as the stabilised diazo compound. See C.I.37275

60505 **C.I. Disperse Red 9 (Bright bluish red)**
C.I. Solvent Red 111 (Red)

Bayer Co., GP 144634 (Fr. 7, 201), 175024 (Fr. 8, 283)
Badische Co., BP 21710/11; GP 256515 (Fr. 11, 551)
Brit. Dye. Corp., BP 211720
Brit. Celanese, BP 219349

Treat 1-chloroanthraquinone or 1-anthraquinonesulfonic acid with methylamine under pressure in the presence of an oxidising agent

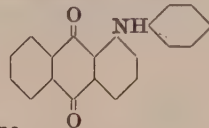
Soluble in acetone, alcohol, Cellosolve, linseed oil
Slightly soluble in benzene, carbon tetrachloride
Insoluble in Stoddard solvent
H₂SO₄ conc. — brown; on dilution — dull orange

60507 **C.I. Disperse Red 3 (Pink → Bright red)***

Discoverer — Bayer Co. 1910
GP 235312 (Fr. 10, 589)

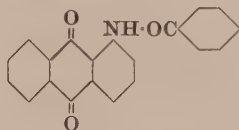
1-(2-Hydroxyethylamino)anthraquinone

* On acetate

60510 **C.I. Disperse Red 22 (Pink)**

Discoverer — Bayer Co. 1903
GP 165728 (Fr. 8, 289); GP 187870 (Fr. 9, 126)

1-Anilinoanthraquinone

60515 **Vat Dye (Yellow)**

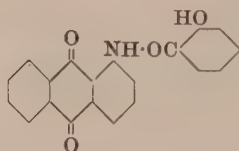
Condense 1-aminoanthraquinone with benzoyl chloride or benzoic acid

Discoverer — J. Deinet 1909

Algol Yellow WG (By)

Application method A/Q3
Possesses low tinctorial power
Fastness Properties: Chlorine, good; Light, good
C.I.1126 (1st Edn.) — unconfirmed
Bayer Co., BP 2702/09, 3055/09; USP 957041, 964816, 978138;
FP 400653, 404190; GP 216772, 225232, (Fr. 9, 747, 1197),
226940, 243490, 248289, (Fr. 10, 649, 652, 650)
Wedekind Co., BP 14476/12; GP 278103, 283356, 287042, (Fr. 12,
292, 289, 290)
Scottish Dyes, BP 324311
Reverdin, *Helv. Chim. Acta*, 1 (1918), 209
Battegay & Claudius, *Chim. et Ind.* 6, 592; *Chem. Zent.* 2 (1922),
812
Fraser-Thomson, *JSDC*, 52 (1936), 241
Barnett, 191, 215
Fierz-David, 573
Houben, 457, 460
Mayer, 178
Thorpe, 1, 232

Soluble in pyridine (hot), xylene
H₂SO₄ conc. — yellowish orange; on dilution — yellow ppt.
Na₂S₂O₄, alkaline — red; acid — red

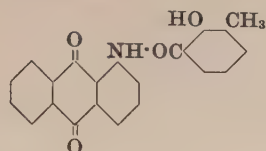
60520 **C.I. Pigment Yellow 23 (Bright greenish yellow**
→ Bright yellow)

Discoverer — P. Thomaschewski 1909

Bayer Co., BP 2702/09, 3055/09; USP 957125, 964816; FP 400653,
404190; GP 225232 (Fr. 9, 1197), 226940 (Fr. 10, 649)
BIOS 1484, 68; BIOS 1661, 74
FIAT 764 — Helioechtgelb 6GL
Barnett, 215
Fierz-David, 573, 619
Houben, 457, 460
Thorpe, 1, 233

Condense 1-aminoanthraquinone with salicylic acid

Soluble in nitrobenzene, pyridine
H₂SO₄ conc. — yellowish red; on dilution — yellow ppt.

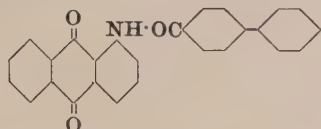
60525 **Vat Dye (Yellow)**

Condense 1-aminoanthraquinone with 2,3-cresotinic acid

Discoverer — I.G.

Helindon Brilliant Yellow GF (IG)

FIAT 764; *FDX* 885 (*PB* 74762) — Helindonbrillantgelb GF

60530 **Vat Dye**

Condense 1-aminoanthraquinone with 4-biphenylcarboxylic acid in the presence of thionyl chloride

Note — Parent compound for the preparation of **C.I.60531**

Discoverer — O. Bayer 1930

I.G., *BP* 369568; *USP* 1877791; *GP* 565426 (*Fr.* 19, 2013)

BIOS 1493, 52

60531 **C.I. Solubilised Vat Yellow 7 (Bright greenish yellow)**

Leuco sulfuric ester of **C.I.60530**

Prepare by general methods — *see* **C.I.59051A**

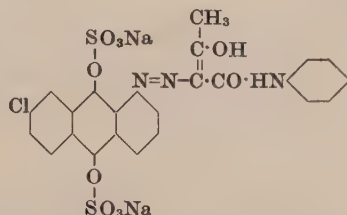
Discoverers and references —

General — *see* **C.I.59051A**

Additional —

BIOS 1493, 73

FIAT 764 — Anthrasolgelb V

60600 **Solubilised Vat Dye**

Couple diazotised 1-amino-7-chloroanthraquinone with acetoacetanilide and then convert to the disodium salt of the disulfuric ester of the leuco compound

Discoverers — K. Schirmacher and E. Besler 1930

References —

General — *see* **C.I.59051A**

Additional —

Anthrasol Yellow IG (IG)

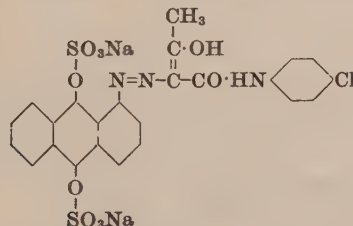
Essentially for printing

Fastness Properties (C): Hypochlorite 4-5, Light 6, Soda boil 3-4, Washing 3-4

I.G., *GP* 539115 (*Fr.* 18, 970), 723132 (*Fr.-Bayer*, I-2, 740) and Appln. J. 62385 (2-9-39)

BIOS 1088, 15

BIOS-MISC 20, App. 52

60605 **C.I. Solubilised Vat Yellow 8 (Bright yellow)**

Couple diazotised 1-aminoanthraquinone with *p*-chloroacetoacetanilide and convert to the disodium salt of the disulfuric ester of the leuco compound

Discoverers — K. Schirmacher and E. Besler 1930

References —

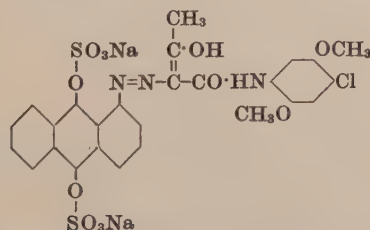
General — *see* **C.I.59051A**

Additional —

I.G., *GP* 539115 (*Fr.* 18, 970), 723132 (*Fr.-Bayer*, I-2, 740) and Appln. J. 62385 (2-9-39)

BIOS 1088, 14

BIOS-MISC 20, App. 51

60610 **Solubilised Vat Dye (Yellowish orange → Orange)**

Couple diazotised 1-aminoanthraquinone with 4'-chloro-2',5'-dimethoxyacetoacetanilide and then convert to the disodium salt of the disulfuric ester of the leuco compound

Discoverers — K. Schirmacher and E. Besler 1930

References —

General — *see* **C.I.59051A**

Additional —

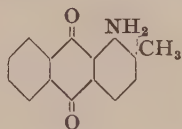
Anthrasol Golden Orange IGG (FH)

Fastness Properties (C): Hypochlorite 5, Light 4-5, 6, 7, Soda boil 4

I.G., *GP* 539115 (*Fr.* 18, 970), 723132 (*Fr.-Bayer*, I-2, 740) and Appln. J. 62385 (2-9-39)

BIOS-MISC 20, App. 48

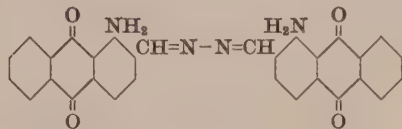
For the Anthraquinone-Azo pigment obtained by coupling diazotised 1-amino-3-bromoanthraquinone with 2,5-dimethoxyacetanilide *see* **C.I.11750**

60700 C.I. Disperse Orange 11 (Bright orange)

Nitrate 2-methylantraquinone and reduce with aqueous sodium sulfide

Discoverers — F. Römer and Link 1883
Discoverer of use as dye for acetate — Brit. Dye. Corp. 1923
 Brit. Dye. Corp., BP 211720
 FIAT 764 — Cellitonorange R
 Römer & Link, *Ber.* **16** (1883), 698
 Locher & Fierz, *Helv. Chim. Acta*, **10** (1927), 642
 Fierz-David & Blangey, 228
 Thorpe, **1**, 41

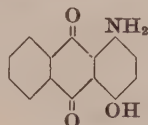
Soluble in acetone, alcohol, benzene, Cellosolve, linseed oil
 Slightly soluble in carbon tetrachloride
 H₂SO₄ conc. — greenish yellow; on dilution — orange ppt.

60705 C.I. Vat Red 18 (Bordeaux)

Treat 1-amino-2-anthraquinonecarboxaldehyde or anthraquinone-1,2-isoxazole with hydrazine hydrate

Discoverers — G. Kalischer and K. Wilke 1915
 Cassella Co., BP 148339, 150709, 153055; GP 343064, 343252, 346188, (*Fr.* **13**, 396, 404, 395), 357042, 359138, (*Fr.* **14**, 860, 862)
 M.L.B., GP 360422, 364181, (*Fr.* **14**, 860, 861)
 I.G., GP 479350 (*Fr.* **16**, 1231), 533249 (*Fr.* **18**, 1245)
 BIOS 987, 5, 64
 Ruggli & Henzi, *Helv. Chim. Acta*, **13** (1930), 409
 Sunthakar & Venkataraman, *Proc. Ind. Acad. Sci.* **25A** (1947), 467; **32A** (1950), 240
 Venkataraman, 897

Na₂S₂O₄, alkaline — olive; acid — brownish olive

60710 C.I. Disperse Red 15 (Bluish pink → Bluish red)

(a) Partially aminate leuco-quinizarin with aqueous ammonia under pressure

(b) Nitrate 1-hydroxyanthraquinone in sulfuric acid in presence of boric acid. Reduce the 1-hydroxy-4-nitroanthraquinone formed with aqueous sodium sulfide

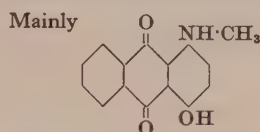
(c) Nitrate 1-methoxyanthraquinone, hydrolyse and reduce

(d) Hydrolyse 1-benzamido-4-chloroanthraquinone

Discoverers — R. E. Schmidt and L. Gattermann 1876
Discoverers of use as dye for acetate — J. Baddiley and A. Shepherdson 1923

Schmidt & Gattermann, *Ber.* **29** (1876), 2943
 Brit. Dye. Corp., BP 211720
 I.G., FP 725054
 BIOS 1484, 62; CIOS XXVII-84, 62
 CIOS XXXII-58, App. 5; FIAT 1313, 2, 200
 FIAT 764 — Cellitonechtrosa B, Rauchbordo BN
 Wacker, *Ber.* **35** (1902), 3293
 Ullmann & Conzetti, *Ber.* **53** (1920), 834
 Brass & Ziegler, *Ber.* **58** (1925), 763

Soluble in acetone, alcohol, benzene, linseed oil
 H₂SO₄ conc. — dull yellow; on dilution — brown

60715 C.I. Disperse Blue 22 (Bright reddish blue)

Treat leuco-quinizarin with methylamine in methylated spirit and oxidise

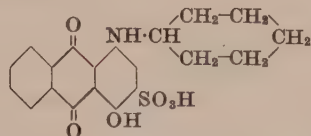
Note — Due to the method of preparation considerable quantities of the bis(methylamino) compound (C.I.61500) are also present

Discoverer — Bayer Co. 1900
Discoverer of use as dye for acetate — Brit. Celanese 1923
 Bayer Co., GP 144634 (*Fr.* **7**, 201)
 Brit. Celanese, BP 219349

Soluble in acetone, alcohol, benzene
 H₂SO₄ conc. — orange brown; on dilution — blue

60720 Solvent Dye

Cyclohexylamine salt of

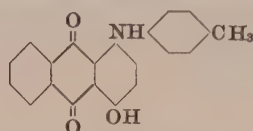


Note — In FIAT 1313, 3, 132, this product is described as a 1-piperidyl derivative

Zapon Fast Blue CR (IG)

Dye for alcoholic solvents

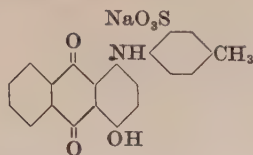
FDX 885 (PB 74725) — Zaponechtblau CR

60725 C.I. Solvent Violet 13 (Bright bluish violet)

Treat quinizarin or leuco-quinizarin or 1-bromo(or chloro)-4-hydroxyanthraquinone with *p*-toluidine

Discoverer — R. E. Schmidt 1894
 Bayer Co., BP 23927/94, 7538/96; FP 243315; GP 86150, 91149, 91150, 93223, (*Fr.* **4**, 308, 315, 316, 320), 127532 (*Fr.* **6**, 368)
 United Alkali Co., BP 248874
 Du Pont, USP 2419405
 BIOS 1484, 48; FIAT 764 — Irisol Spritl.
 Friedländer & Schick, *Z. Farb.-Ind.* **2** (1903), 429; **3** (1904), 219
 Meyer, *Ber.* **53** (1920), 1269
 Houben, 454, 455
 Fierz-David & Blangey, Table 18

Solubilities. See Solvent section (Vol. 2, p. 2870)
 H₂SO₄ conc. — dull green; on dilution — olive → reddish blue ppt.

60730 C.I. Acid Violet 43 (Bluish violet)

Sulfonate **C.I.60725** and convert to the sodium salt

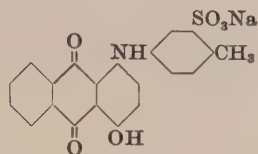
Discoverer and references as **C.I.60725**

Additional references —

Bayer Co., *FP* 243316; *GP* 84509 (*Fr.* 4, 325)
BIOS 1484, 48; *FIAT* 764 — Anthralanviolett 3B
Barnett, 203
Fierz-David, 520
Fierz-David & Blangey, Table 18

Soluble in alcohol

H₂SO₄ conc. — bright blue; on dilution — reddish blue ppt.

60735 Acid Dye

Condense leuco-quinizarin with 5-amino-*o*-toluenesulfonic acid and convert to the sodium salt

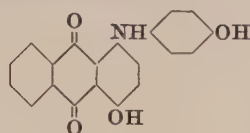
Discoverer — M.L.B. 1903

Alizarin Direct Violet R (MLB)

M.L.B., *BP* 26182/03; *FP* 339192; *GP* 181879 (*Fr.* 8, 318)
 Friedländer & Schick, *Z. Farb.-Ind.* 2 (1903), 429; 3 (1904), 219, 292
 Grandmougin, *Rev. gén. Mat. col.* 12 (1908), 37
 Meyer, *Ber.* 53 (1920), 1265
Barnett, 203
Houben, 455

Slightly soluble in alcohol

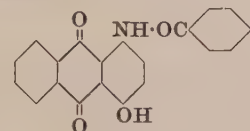
H₂SO₄ conc. — blue (dichroic); on dilution — olive brown → violet ppt.

60740 Disperse Dye (Blue)

Discoverer — I.G. 1943

Perlon Fast Blue FFR (IG)

BIOS-MISC 20, 32

60745 C.I. Pigment Red 89 (Bluish pink)

Condense 1-amino-4-hydroxyanthraquinone with benzoyl chloride in *o*-dichlorobenzene

Discoverer — J. Deinet 1909

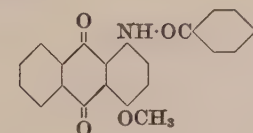
Formerly used as a vat dye — **Algol Pink R (By)**

Bayer Co., *BP* 2702/09, 3055/09; *USP* 957041, 957146; *FP* 400653, 404190; *GP* 225232 (*Fr.* 9, 1197), 226940 (*Fr.* 10, 649)
BIOS 1484, 63; *BIOS* 1661, 73
FIAT 764 — Algolrosa R, Helioechtrosa RL
 Vlies, *JSDC*, 30 (1914), 29
Barnett, 215
Fierz-David, 573
Houben, 458, 460
Mayer, 178
Thorpe, 1, 232, 416

Soluble in xylene

H₂SO₄ conc. — red; on dilution — bluish red ppt.

Na₂S₂O₄, alkaline — yellowish red; acid — bright yellow

60750 Vat Dye

Condense 1-amino-4-methoxyanthraquinone with benzoyl chloride

Discoverer — J. Deinet 1909

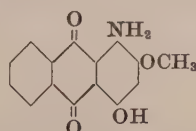
Algol Scarlet G (By)

Bayer Co., *BP* 2702/09, 3055/09; *USP* 957039, 957041, 964816; *FP* 400653, 404190; *GP* 225232 (*Fr.* 9, 1197), 226940 (*Fr.* 10, 649)
 Vlies, *JSDC*, 30 (1914), 29
 Schmidt, *Bull. Soc. ind. Mulhouse*, 84 (1914), 417
Barnett, 215
Fierz-David, 573
Houben, 458, 460
Mayer, 178
Thorpe, 1, 232, 416

Soluble in tetrahydronaphthalene, xylene

H₂SO₄ conc. — dull yellow; on dilution — red ppt.

Na₂S₂O₄, alkaline — orange; acid — yellow

60755 C.I. Disperse Red 4 (Bright pink)

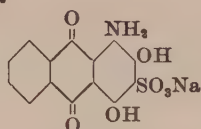
Methylate 4-aminoxanthopurpurin with dimethyl sulfate in an acetone-water solution

Discoverer — I.G. 1932

BIOS 1484, 62

FIAT 764 — Cellitonechtrosa RF

H₂SO₄ conc. — orange; on dilution — red ppt.

60760 Pigment

Heat **C.I.58210** with ammonia

Note — Amination may affect the β -OH group

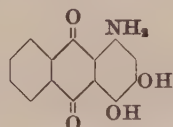
Discoverer — Bayer Co. 1913

Helio Fast Rubine BBL (IG)

Heavy metal lakes used as pigments for paints, printing inks and wallpapers

BIOS 1484, 64; *BIOS* 1661, 71

FIAT 764 — Helioechtrubin BBL

60765 Mordant Dye

Reduce 4-nitroalizarin with sodium sulfide

Discoverer — W. H. Perkin 1877

Alizarin Claret R (MLB)

Bluish red on aluminium- and claret on chromium-mordanted cotton. Fastness Properties: Chlorine, good; Light, moderate; Milling, moderate (*C.I.1032* (1st Edn.) — unconfirmed)

M.L.B., *BP* 14717/92; *FP* 223766; *GP* 66811 (*Fr.* 3, 261)

Perkin, *JCS*, **30** (1876), 580

Brasch, *Ber.* **24** (1891), 1613

Barnett, 284

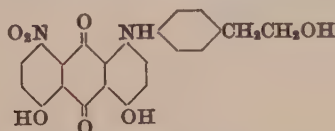
Houben, 443, 445, 462

Fierz-David & Blangey, Table 20

Soluble in alcohol (carmine red)

Insoluble in water

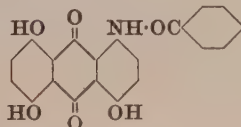
H₂SO₄ conc. — brown; on dilution — carmine ppt.

60767 C.I. Disperse Blue 27 (Blue)

Condense *p*-aminophenethyl alcohol with 1,8-dihydroxy-4,5-dinitroanthraquinone

Discoverers — J. M. Straley and J. B. Dickey 1953

Eastman Kodak, *USP* 2641602

60770 Vat Dye (Violet)

Condense 1-amino-4,5,8-trihydroxyanthraquinone with benzoyl chloride

Discoverer — J. Deinet 1909

Algol Violet B (By)

Application method A/Q3

Fastness Properties: Chlorine, good; Light, good (*C.I.1130* (1st Edn.) — unconfirmed)

Bayer Co., *BP* 2702/09; *USP* 957041; *FP* 400653; *GP* 225232 (*Fr.* 9, 1197)

Werner, *Färberztg.* (1910), 390

Vlies, *JSDC*, **30** (1914), 29

Barnett, 215, 218

Fierz-David, 574

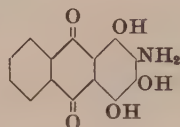
Houben, 459

Thorpe, **1**, 232

Soluble in tetrahydronaphthalene, xylol

H₂SO₄ conc. — blue; on dilution — reddish violet ppt.

Na₂S₂O₄, alkaline — brownish red

60875 Mordant Dye (Chromium — Dull red)

Reduce the crude product obtained by the nitration of commercial alizarin in sulfuric acid solution

Discoverer — R. Bohn 1885

Bordeaux of moderate fastness on aluminium- or chromium-mordanted cotton (*C.I.1041* (1st Edn.) — unconfirmed)

Caro, *BP* 1229/76; *USP* 186032

M.L.B., *BP* 14717/92; *FP* 223766; *GP* 66811, 74431, (*Fr.* 3, 261, 264)

Bayer Co., *BP* 2695/93; *GP* 74562, 74598, (*Fr.* 3, 266, 264)

Caro, *Ber.* **10** (1877), 1760; **25** (1892), 1045

Schunck & Römer, *Ber.* **12** (1879), 588

Römer, *Ber.* **18** (1885), 1666

Brasch, *Ber.* **24** (1891), 1610

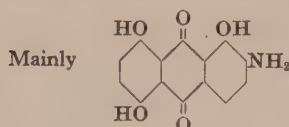
Schmidt, *J. prakt. Chem.*, **43** (1891), 233

Barnett, 284

Houben, 443, 446, 462, 463

Insoluble in water

H₂SO₄ conc. — red; on dilution — brown ppt.

60880 C.I. Mordant Blue 24 (Chromium—Reddish navy)

Mainly

Discoverer — R. E. Schmidt 1890

Bayer Co., *BP* 12715/90; *FP* 206564 (2nd addn.); *GP* 61919 (*Fr.* 3, 233)

FDX 885 (PB 82170) — Alizarincyanin RR

BIOS 1484, 33

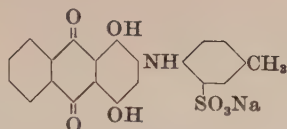
FIAT 764 — Alizarincyanin RR

Soluble in water and in alcohol (reddish violet)

H₂SO₄ conc. — reddish violet; on dilution — orange brown

HCl conc. added to aq. soln. — brown ppt.

NaOH conc. added to aq. soln. — dark blue

60885 Mordant Dye

Condense leuco-purpurin with *p*-toluidine, sulfonate and convert to the sodium salt

Discoverer — R. E. Schmidt 1899

Alizarin Heliotrope BB, R (By)

Violet on aluminium- and chromium-mordanted wool and cotton. Suitable for printing. Dischargeable. Fastness Properties: Washing, good (Schultz (7th Edn.) 1191 — unconfirmed)

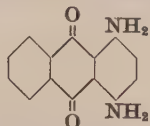
Fierz-David, 519

Fierz-David & Blangey, Table 20

Soluble in alcohol

H₂SO₄ conc. — bluish red; on dilution — violet ppt.

H₂SO₄ + boric acid — bluish green

**61100 C.I. Disperse Violet 1 (Bright violet)
C.I. Solvent Violet 11 (Bright violet)**

(a) Condense quinizarin with aqueous ammonia and sodium hydrosulfite under pressure. Oxidise the leuco-1,4-diaminoanthraquinone in a mixture of *o*-dichlorobenzene and nitrobenzene

(b) Oxidise leuco-1,4-diaminoanthraquinone in sulfuric acid with chlorine

Discoverer — Bayer Co. 1902

Bayer Co., *BP* 9194/02; *GP* 135561 (*Fr.* 6, 298)

Brit. Dye. Corp., *BP* 211720, 268891

BIOS 1484, 62

FIAT 764 — Cellitonechtrotviolett RN, Sudanviolett R

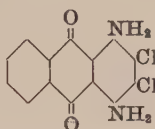
Noelting & Wortman, *Ber.* 30 (1897), 637

Fierz-David & Blangey, 230, Table 19

Thorpe, 1, 41

Soluble in acetone, alcohol, benzene, linseed oil

H₂SO₄ conc. — dull brownish yellow; on dilution — clearer

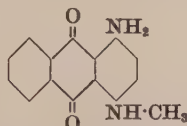
61102 C.I. Disperse Violet 28 (Bright violet)

Chlorinate 1,4-diaminoanthraquinone with sulfuryl chloride in nitrobenzene

Discoverer — Bayer Co. 1912

GP 268592 (*Fr.* 11, 569)

H₂SO₄ conc. — pale dull brown; on dilution — violet

**61105 C.I. Disperse Violet 4 (Bright bluish violet)
C.I. Solvent Violet 12 (Bright bluish violet)**

(a) Methylate leuco-1,4-diaminoanthraquinone with methanol in sulfuric acid in the presence of chlorine

(b) Treat leuco-quinizarin with ammonia and methylamine and oxidise

Discoverer — I.G.

BIOS 1484, 61; *FIAT* 1313, 2, 205

FIAT 764 — Cellitonechtviolett 6B

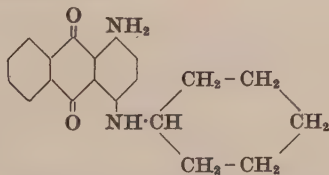
Thorpe, 1, 41

Soluble in acetone, benzene

Slightly soluble in alcohol

Insoluble in linseed oil

H₂SO₄ conc. — brown; on dilution — red

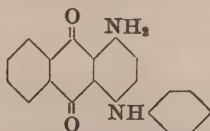
61107 Solvent Dye

Condense 1-amino-4-bromoanthraquinone with cyclohexylamine

Discoverer — I.G.

Mowilith Blue R (IG). For polyvinyl acetate finishes

FDX 885 (*PB* 74741) — Mowilithblau R

**61110 C.I. Disperse Blue 19 (Bright reddish blue)
C.I. Solvent Blue 68 (Reddish blue)**

Condense 1-amino-4-hydroxyanthraquinone with aniline in the presence of boric acid

Discoverer — Bayer Co. 1900

Bayer Co., *GP* 125666 (*Fr.* 6, 370)

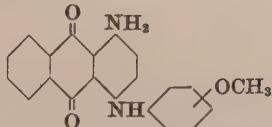
FDX 885 (*PB* 74722) — Setacyldirektblau RS

Mellor & Olpin, *JSDC*, 67 (1951), 621

Soluble in acetone, alcohol, benzene, Cellosolve

Slightly soluble in carbon tetrachloride

H₂SO₄ conc. — dull bluish violet; on dilution — dull blue ppt.

61115 Disperse Dye

Discoverer — I.G.

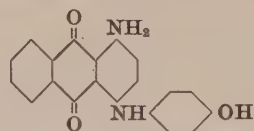
I.G., *GP* 487941 (*Fr.* 16, 1635)

FDX 885 (*PB* 74706) — Cellitonechtblau FR

Note — Main component of **C.I. Disperse Blue 9**

61120

Disperse Dye



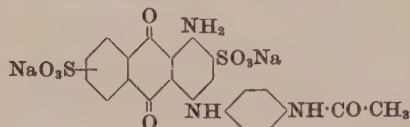
Discoverer — I.G.

Perlon Fast Blue FFB (IG)

BIOS 1120, 14; BIOS-MISC 20, 32

61125

C.I. Acid Blue 23 (Greenish blue)

(a) Condense 1-amino-4-bromo-2,5(or 2,8)anthraquinonedisulfonic acid with *p*-aminoacetanilide(b) React 1-amino-2-bromo-4-(*p*-acetamidoanilino)-5(or 8)-anthraquinonesulfonic acid with sodium sulfite

Discoverer — S. von Allmen 1928

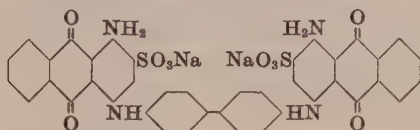
Sandoz., USP 1885065; FP 686738; SwissP 150808

Buxtorf & Peter, Text-Rund. 8 (1953), 2

H₂SO₄ conc. — dark violet; on dilution — reddish blue

61130

C.I. Acid Blue 150 (Dull greenish blue)



React 2 mol. 1-amino-4-anilino-2-anthraquinonesulfonic acid with manganese dioxide

Discoverer — E. Gutzwiller 1934

Sandoz., BP 441412; USP 2076197; FP 785494; SwissP 181533;

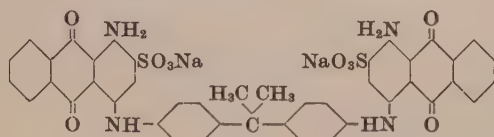
GP 621369 (Fr. 22, 1044)

Buxtorf & Peter, Text-Rund. 8 (1953), 3

H₂SO₄ conc. — dark violet; on dilution — violet ppt.

61135

C.I. Acid Blue 127 (Blue)



Condense 2 mol. 1-amino-4-bromo-2-anthraquinonesulfonic acid with 1 mol. 4,4'-isopropylidenedianiline and convert to the sodium salt

Discoverer — K. Weinand 1935

FIAT 1313, 2, 230

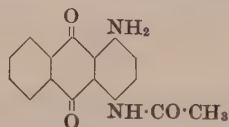
FIAT 764 — Supranolblau GG

I.G., BP 481892; USP 2156887; FP 810605; GP 644408 (Fr. 23 961)

H₂SO₄ conc. — yellowish green; on dilution — bluish red

61140

C.I. Disperse Violet 6 (Reddish violet)



De-acetylate 1,4-diacetamidoanthraquinone under controlled conditions

Discoverer — G. H. Ellis 1925

Brit. Celanese, BP 263260; USP 1989133

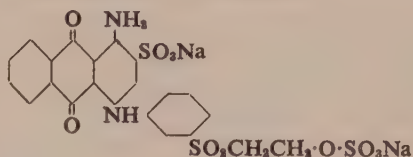
Soluble in acetone, alcohol, benzene, Cellosolve

Slightly soluble in Stoddard solvent

H₂SO₄ conc. — yellowish brown; on dilution — yellowish brown ppt.

61200

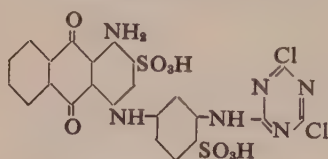
C.I. Reactive Blue 19 (Bright blue)



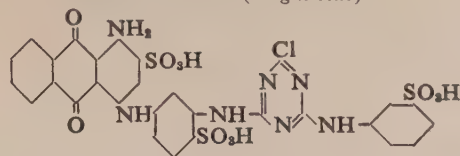
Hagen, Reese, and Stamm, Helv. chim. Acta, 49 (1966) 2278-2287

61205

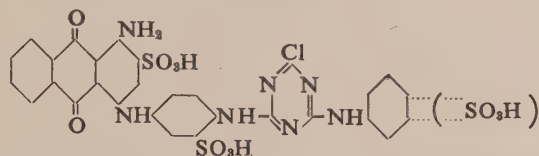
C.I. Reactive Blue 4 (Bright blue)



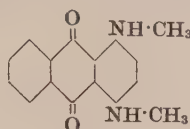
Stamm, Zollinger, Zähler and Gäumann, Helv. chim. Acta, 44 (1961) 1123-1125

61205:1 C.I. Reactive Blue 5 (Bright blue)

Panchartek, Allan and Mužík, *Coll. Czech. Chem. Commun.*,
25 (1960) 2783-2799
Austrian Pat. 201,746

61211 C.I. Reactive Blue 2 (Bright blue)

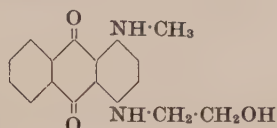
Panchartek, Allan and Mužík, *Coll. Czech. Chem. Commun.*,
25 (1960) 2783-2799
Austrian Pat. 201,746

61500 C.I. Disperse Blue 14 (Bright blue)

Discoverer — I.G. 1927
M.L.B., BP 15355/08
Brit. Celanese, BP 219349
Brit. Dye. Corp., BP 268891
BIOS 1484, 54; FIAT 1313, 2, 206
FIAT 764 — Cellitonechtblau B

Treat quinizarin under pressure with aqueous methylamine and sodium hydrosulfite or zinc dust. Oxidise the leuco compound with nitrobenzene, or hot sulfuric acid

Soluble in acetone, alcohol, glacial acetic acid, nitrobenzene, pyridine, toluene
H₂SO₄ conc. — reddish brown

61505 C.I. Disperse Blue 3 (Bright blue)

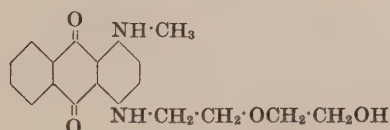
Discoverers — K. Köberle, R. Schweizer, C. Steigerwald, E. Runne, and L. Berlin 1933
I.G., BP 434906, 447037, 447090, 447107, 447108; USP 2051004;
GP 638834 (Fr. 23, 988), 722593
BIOS 987, 155; BIOS 1484, 57; FIAT 1313, 2, 206
FIAT 764 — Cellitonechtblau FFR

(a) Condense methylamine and ethanolamine with quinizarin and leuco-quinizarin in isobutanol and oxidise

(b) Condense 1-bromo-4-methylaminoanthraquinone with ethanolamine in presence of copper acetate

Note — According to BIOS 987, 1,4-bis(methylamino)- and 1,4-bis(2-hydroxyethylamino)anthraquinone are also present

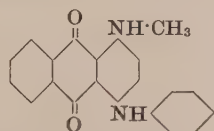
Soluble in acetone, alcohol, benzene, Cellosolve
Slightly soluble in carbon tetrachloride
Insoluble in Stoddard solvent
H₂SO₄ conc. — brown; on dilution — dull red

61510 C.I. Disperse Blue 34 (Blue)

Discoverer — I.G.
BIOS 987, 157; BIOS 1484, 58; BIOS-MISC 20, 40
FIAT 1313, 3, 78
FIAT 764 — Cellitonechtblau FW

Condense diglycolamine and methylamine with quinizarin and a little leuco-quinizarin under pressure in isobutanol

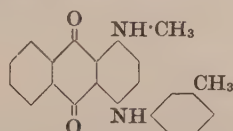
Slightly soluble in water

61515 C.I. Disperse Blue 24 (Bright blue)

Brominate 1-methylaminoanthraquinone and condense with aniline

Discoverer — Bayer Co. 1901
GP 159129 (Fr. 8, 323); GP 175069 (Fr. 8, 291)

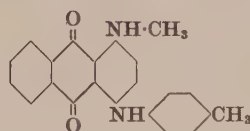
Soluble in acetone, alcohol, benzene

61520 C.I. Solvent Blue 63 (Blue)

Treat 1-bromo-4-methylaminoanthraquinone with *m*-toluidine

Discoverer — R. E. Schmidt 1901
CIOS XXXII-58, App. A, 2
FIAT 764 — Sudanblau GN
GP 159129 (Fr. 8, 323)

H₂SO₄ conc. — reddish violet; on dilution — reddish yellow

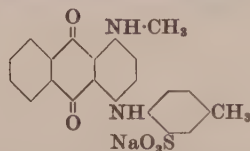
61525 C.I. Solvent Blue 11 (Bright blue)

Treat 1-bromo-4-methylaminoanthraquinone with *p*-toluidine

Discoverer — R. E. Schmidt 1901

Bayer Co., *BP* 22583/01; *GP* 159129 (*Fr.* 8, 323)
C.I.O.S. XXVII-84, 64; *C.I.O.S.* XXXII-58, App. A, 2
FIAT 1313, 2, 222
FIAT 764 — Sudanblau G
Fierz-David & Blangey, Table 18

Solubilities. *See* Solvent section (Vol. 2, p. 2876)
 H_2SO_4 conc. — reddish violet; on dilution — reddish yellow

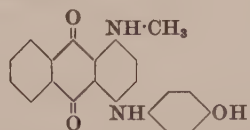
61530 C.I. Acid Blue 27 (Greenish blue)

Sulfonate **C.I.61525** with 100% sulfuric acid and convert to the sodium salt

Discoverer — R. E. Schmidt 1901

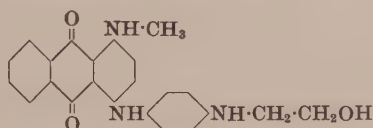
Bayer Co., *BP* 22838/01; *GP* 163646 (*Fr.* 8, 324)
FIAT 1313, 2, 222
FIAT 764 — Alizarinastrol B
Houben, 451, 452

Soluble in acetone, alcohol, *o*-chlorophenol, pyridine
 Slightly soluble in Cellosolve
 Insoluble in chloroform, toluene
 H_2SO_4 conc. — blue; on dilution — violet

61535 Disperse Dye

Discoverer — I.G.

Perlon Fast Green 3B (IG)
BIOS 1120, 15; *BIOS-MISC* 20, 30

61540 Disperse Dye (Bluish green)

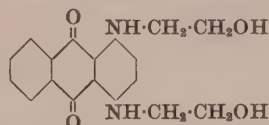
Treat 1-(*p*-aminoanilino)-4-methylaminoanthraquinone with ethylene chlorohydrin

Discoverers — A. Wolfram and E. Hausdörfer 1931

Celliton Fast Green 5B (IG)

Fastness Properties (C): Hot pressing 4-5, Light 4-5, 5, 6,
 Steaming (volatility) 4
 Dischargeability poor

I.G., *BP* 385202; *USP* 1980025; *GP* 567287 (*Fr.* 19, 2008)
FDX 885 (*PB* 74706) — Cellitonechtgrün 5B

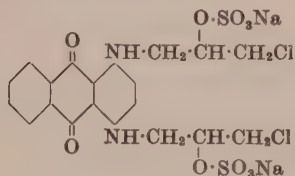
61545 C.I. Disperse Blue 23 (Bright blue)

Condense quinizarin or leuco-quinizarin with ethanolamine

Discoverer — I.G. 1931

I.G., *BP* 289807
FIAT 764 — Cellitonechtblau BF

H_2SO_4 conc. — bordeaux; on dilution — violet

61550 Acid Dye (Bright blue)

To a boiling solution of 1,4-diaminoanthraquinone in glacial acetic acid add epichlorohydrin, sulfate and convert to the sodium salt

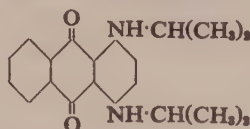
Discoverer — W. Berchemann 1910

Alizarine Uranol R (By)

Applied from a Glauber's salt-sulfuric acid bath. Levelling 3
 Fastness Properties (C): Carbonising 4, Light 4, 4-5, 5,
 Milling 2-3, Perspiration 3, Washing 3

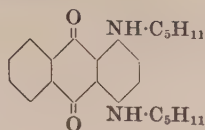
Bayer Co., *BP* 11930/09; *FP* 403205; *GP* 218571, 220627, (*Fr.* 9, 714, 715)
BIOS 1484, 43
FIAT 764 — Alizarinuranol R
Fierz-David, 519
Houben, 454
 Rowe, *RIC lectures*, 82
 Thorpe, 1, 407

Soluble in alcohol
 H_2SO_4 conc. — violet; on dilution — magenta red → violet ppt.

**61551 C.I. Disperse Blue 134 (Blue)
C.I. Solvent Blue 36 (Bright blue)**

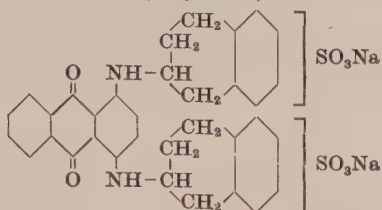
1,4-Bis(isopropylamino) anthraquinone

M. S. Simon, *J. Amer. Chem. Soc.*, 85 (1963), 1975; melting point and spectrum

61555 C.I. Solvent Blue 14

Treat leuco-quinizarin with amylamine

Soluble in acetone, butyl acetate, Cellosolve, toluene
Slightly soluble in ethanol
Insoluble in water

61560 C.I. Acid Blue 35 (Bright blue)

Condense quinizarin and leuco-quinizarin with 1,2,3,4-tetrahydro-2-naphthylamine, sulfonate and convert to the sodium salt

Discoverers — K. Zahn, H. Koch, and K. Weinand 1933

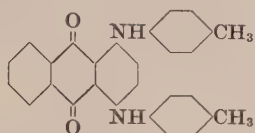
Alizarine Brilliant Sky Blue SE (IG)

I.G., BP 434429; FP 743330; GP 602959 (Fr. 21, 1067)

BIOS 1484, 43; FIAT 1313, 2, 235

FIAT 764 — Alizarinbrilliantreinblau SE

Soluble in alcohol
Insoluble in Cellosolve
H₂SO₄ conc. — pale dull brown; on dilution — deep violet

61565 C.I. Solvent Green 3 (Bluish green)

(a) Condense leuco-quinizarin or a quinizarin/leuco-quinizarin mixture with 2 mol. *p*-toluidine in the presence of boric acid

(b) Condense 1,4-dichloroanthraquinone with 2 mol. *p*-toluidine

Discoverer — R. E. Schmidt 1894

Bayer Co., BP 23927/94, 4961/95, 7538/96; USP 599426, 599427; FP 243315, 243316; GP 86150, 86539, 89862, 91149, 91150, 91152, 92591, 92997, 93310, 94396, (Fr. 4, 308, 312, 327, 315, 316, 318, 319, 328, 327, 322), 95547, 95625, 107730, (Fr. 5, 292, 294, 330), 125698, 126803), (Fr. 6, 359, 362)

United Alkali Co., BP 248874

National Aniline, USP 1548768, 1698821

Du Pont, USP 1931264

FIAT 1313, 2, 215

FIAT 764 — Alizarincyaningruen fettl.

Meyer, Ber. 53 (1920), 1265

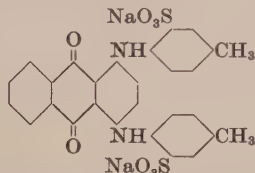
Fierz-David, 516

Houben, 32, 451

Barnett, 199, 203

Fierz-David & Blangey, 317

Solubilities. See Solvent section (Vol. 2, p. 2885)
H₂SO₄ conc. — blue; on dilution — bluish green ppt.

61570 C.I. Acid Green 25 (Bluish green)

Sulfonate C.I.61565 and convert to the sodium salt

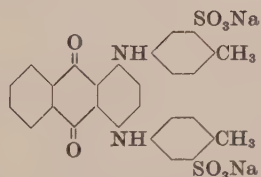
Discoverer — R. E. Schmidt 1894

Bayer Co., GP 84509 (Fr. 4, 325)

FIAT 1313, 2, 215

FIAT 764 — Alizarincyaningruen G

Soluble in *o*-chlorophenol
Slightly soluble in acetone, alcohol, pyridine
Insoluble in chloroform, toluene
H₂SO₄ conc. — dull blue; on dilution — turquoise

61575 Acid Dye

(a) Condense leuco-quinizarin with 2 mol. 5-amino-*o*-toluenesulfonic acid in presence of boric acid and convert to the sodium salt

(b) Condense 1,4-diaminoanthraquinone dissolved in glycerol or phenol with 2 mol. 5-amino-*o*-toluenesulfonic acid in presence of stannous chloride, boric acid and sodium acetate

Discoverer — M.L.B.

Alizarine Direct Green G (MLB)

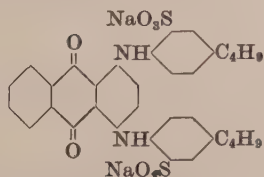
Applied from a Glauber's salt-acetic acid bath, aftertreatment with sodium dichromate giving increased fastness to milling. Applicable also on a chromium mordant. Levelling good
Fastness Properties: Carbonising, very good; Light, very good; Milling, good-very good; Washing, fairly good
(C.I.1079 (1st Edn.) — unconfirmed)

M.L.B., BP 26182/03; USP 754768, 778036; FP 339192; GP 172464, 181879, (Fr. 8, 316, 318)

Barnett, 203, 204

Houben, 451, 452

Soluble in alcohol
H₂SO₄ conc. — dull green; on dilution — violet → bluish green ppt.

61580 C.I. Acid Green 27 (Bluish green)

Treat leuco-quinizarin with *p*-butylaniline, sulfonate and convert to the sodium salt

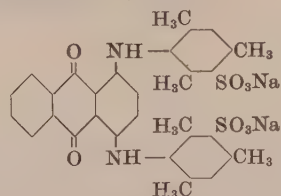
Discoverer — I.C.I. 1933

I.C.I., BP 430160, 437266, 443776, 443835, 449010, 449011, 449012, 452203, 477535, 483325, 484000; SwissP 187434

Harris, Marriott & Smith, JCS (1936), 1838

Smith & Reid, Chem. & Ind. (1948), 678

Venkataraman, 859

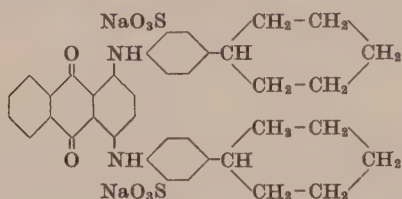
61585 C.I. Acid Blue 80 (Blue)

Condense 1 mol. 1,4-dichloroanthraquinone with 2 mols. mesidine, sulfonate and convert to the sodium salt

Discoverer — A. Peter 1934

Sandoz, BP 457386; USP 2121928; FP 787400; SwissP 181535; GP 631518 (Fr. 23, 952)
Buxtorf & Peter, Text-Rund. 8 (1953), 3

H₂SO₄ conc. — reddish blue; on dilution — greenish blue

61590 C.I. Acid Green 44 (Bluish green)

Condense quinizarin with *p*-cyclohexylaniline, sulfonate and convert to the sodium salt

Discoverers — K. Zahn, H. Koch, and K. Weinand 1933

I.G., BP 434429; FP 743330; GP 602959 (Fr. 21, 1067)
FIAT 1313, 2, 235
FIAT 764 — Alizarincyaningruen GWA

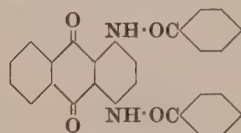
Soluble in alcohol
H₂SO₄ conc. — dull blue; on dilution — turquoise

61595 C.I. Acid Green 36 (Dull green)

Condense 4-biphenylamine with leuco-quinizarin and quinizarin in the presence of boric acid, sulfonate and convert to the sodium salt

Discoverers — K. Zahn and W. Schultheis 1931

I.G., BP 143330; USP 1960564; GP 595472 (Fr. 20, 1333)
BIOS 1484, 34
FIAT 764 — Alizarincyaningruen GT

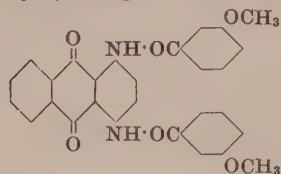
61650 C.I. Vat Red 42 (Yellowish red)

- (a) Condense 1,4-diaminoanthraquinone with benzoyl chloride
(b) Condense 1,4-dichloroanthraquinone with benzamide

Discoverer — J. Deinet 1909

Bayer Co., BP 2702/09, 3055/09; USP 957042, 957125, 964816; FP 400653, 404190; GP 216772, 223103, 225232, (Fr. 9, 747, 1196, 1197), 226940 (Fr. 10, 649)
Wedekind Co., BP 14476/12
BIOS 1493, 40
FIAT 764 — Indanthrenrot 5GK
Vlies, JSDC, 30 (1914), 29
Barnett, 215
Fierz-David, 574
Houben, 458, 460
Fierz-David & Blangey, Table 19
Thorpe, 1, 416

Soluble in tetrahydronaphthalene, xylene
H₂SO₄ conc. — red; on dilution — magenta red ppt.
Na₂S₂O₄, alkaline — dull reddish violet; acid — yellowish brown

61655 Vat Dye (Bluish pink → Bluish red)

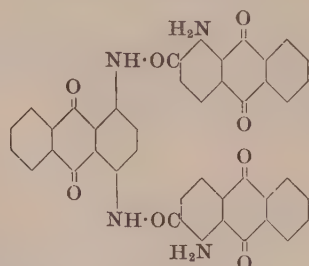
Condense 1,4-diaminoanthraquinone with *m*-methoxybenzoyl chloride in *o*-dichlorobenzene solution

Discoverer — I.G. 1925

Indanthren Red BK (IG)

Application method A/Q3
Fastness Properties (C): Chlorine 5, Light 7, Soda boil 4
BIOS 1493, 39
FIAT 764 — Indanthrenrot BK

H₂SO₄ conc. — dull yellow
Na₂S₂O₄, alkaline — bordeaux; acid — red

61670 C.I. Vat Red 21 (Dull bluish red)

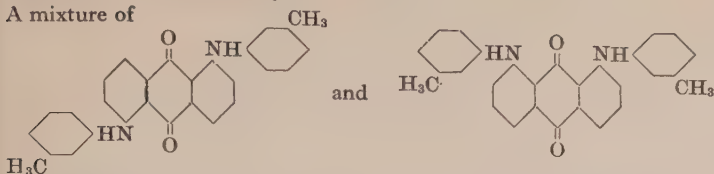
Discoverer — Badische Co.

Kunz, Text-Rund. 6 (1951), 541; Melliand. 33 (1952), 64

Na₂S₂O₄, alkaline — reddish brown; acid — yellowish brown

61700 Smoke Dye

A mixture of

Condense a mixture of 1,5- and 1,8-dichloroanthraquinone with *m*-toluidine

Discoverer — I.G.

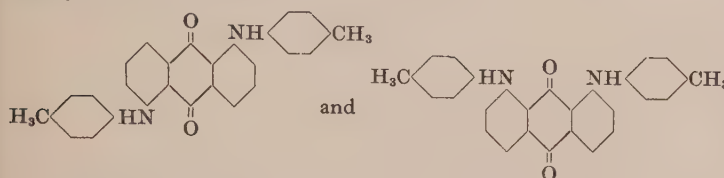
Smoke Violet RN (IG) — For colouring smokes

CIOS XXXII-58, App. 5

FIAT 764 — Rauchviolett RN

61705 C.I. Solvent Violet 14 (Violet)

Mainly a mixture of

Condense a mixture of 1,5- and 1,8-dinitro(or dichloro)anthraquinone with *p*-toluidine

Discoverer — O. Bally 1898

Badische Co., BP 7591/99; USP 659565, 659566; GP 106227, 108274, (Fr. 5, 307, 311)

Brit. Dye. Corp., BP 271602, 308049

FIAT 764 — Sudanviolett BR

Schmidt, *Bull. Soc. ind. Mulhouse*, **84** (1914), 417

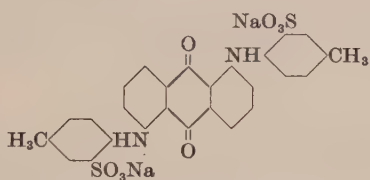
Houben, 452

Fierz-David, 518

Barnett, 199

Fierz-David & Blangey, Table 18

Solubilities. See Solvent section (Vol. 2, p. 2871)

H₂SO₄ conc. — olive green; on dilution — violet ppt.**61710 C.I. Acid Violet 34 (Violet)**Condense 1,5-dinitro(or dichloro)anthraquinone with *p*-toluidine, sulfonate and convert to the sodium salt*Note* — Redder tones are prepared by sulfonating a mixture of 1,5- and 1,8-compounds. See C.I.61800 (note)

Discoverer — O. Bally 1898

Badische Co., BP 7591/99; USP 659565, 659566; GP 106227, 108274, (Fr. 5, 307, 311)

Brit. Dye. Corp., BP 271602, 308049

Schmidt, *Bull. Soc. ind. Mulhouse*, **84** (1914), 417

Houben, 452

Fierz-David, 518

Barnett, 199

Fierz-David & Blangey, Table 18

Soluble in alcohol, Cellosolve, chloroform, *o*-chlorophenol, pyridine, toluene

Slightly soluble in acetone, benzene, carbon tetrachloride

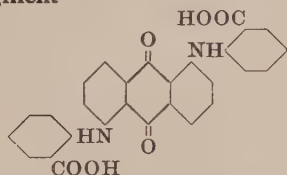
Insoluble in Stoddard solvent

H₂SO₄ conc. — brown; on dilution — reddish violet ppt.**61715 Solvent Dye**

Cyclohexylamine salt corresponding to C.I.61710

Zapon Fast Violet CB (IG)

FIAT 1313, 3, 133

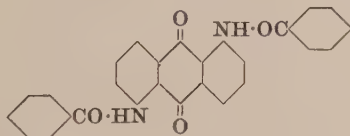
61720 Pigment

Condense 1,5-dichloroanthraquinone with anthranilic acid

Vulcan Violet BN (IG)

Pigment for rubber

FDX 885 (PB 74771) — Vulkanviolett BN

61725 C.I. Vat Yellow 3 (Yellow)

Condense 1,5-diaminoanthraquinone with benzoyl chloride

Discoverers — F. Nölting and W. Wortmann 1906

J. Deinet 1909

Bayer Co., BP 2702/09, 3055/09, 6365/10; USP 938616, 938617, 938618, 938619, 970072, 970073, 972066, 978138; FP 400653, 404190; GP 213473, 216772, 225232, (Fr. 9, 748, 747, 1197), 226940, 233073, (Fr. 10, 649, 652)

Wedekind Co., BP 14476/12; GP 284888 (Fr. 12, 288)

FIAT 764 — Indanthrenelb GK

Nölting & Wortmann, *Ber.* **39** (1906), 638Vlies, *JSDC*, **30** (1914), 29Battagay & Claudin, *Chim. et Ind.* **6**, 592; *Chem. Zent.* **2** (1922), 812

Barnett, 215

Fierz-David, 573

Houben, 458, 460

Fierz-David & Blangey, 322, Table 16

Thorpe, **1**, 232, 416Soluble in tetrahydronaphthalene, xylene
H₂SO₄ conc. — dark olive brown; on dilution — orange ppt.
Na₂S₂O₄, alkaline — bordeaux; acid — reddish yellow**61726 C.I. Solubilised Vat Yellow 3 (Yellow)**

Leuco sulfuric ester of C.I.61725

Prepare by general methods — see C.I.59051A

Discoverers and references —

General — see C.I.59051A

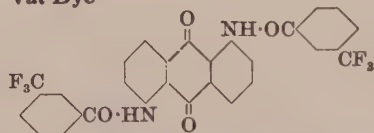
61730 PigmentMixture of **C.I.61725** and its 1,8-isomer

Treat a mixture of 1,5- and 1,8-diaminoanthraquinone with benzoyl chloride

Discoverer — Bayer Co. 1904

Helio Fast Yellow RL (IG)

Pigment for oil paints and wallpapers

Rowe, Burr & Corbishley, *JSDC*, **42** (1926), 82Curtis, *Artificial Organic Pigments and their applications*, No. 43**61735 Vat Dye**Condense 1,5-diaminoanthraquinone with *m*-trifluoromethylbenzoyl fluorideNote — Parent compound for the preparation of **C.I.61736**

Discoverer — I.G.

BIOS 1088, 15; BIOS-MISC 20, App. 53

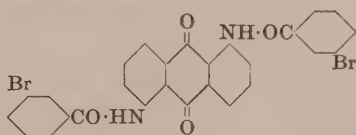
FIAT 1313, 3, 54, 93

61736 Solubilised Vat Dye (Yellow)Leuco sulfuric ester of **C.I.61735**Prepare by general methods — see **C.I.59051A**

Discoverers and references —

General — see **C.I.59051A****Anthrasol Yellow I2G (IG)**

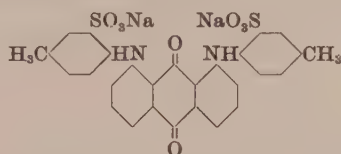
Fastness Properties (C): Light 4–5, Chlorine 5, Soda boil 5

61740 Vat Dye (Yellow)Treat 1,5-diaminoanthraquinone with *m*-bromobenzoyl chloride

Discoverer — Bayer Co. 1908

Algol Yellow WF (By)Bayer Co., BP 2702/09; FP 400653; GP 225232 (*Fr.* **9**, 1197)

FDX 885 (PB 82170) — Algelgelb WF

61800 C.I. Acid Violet 34 (Violet)Condense 1,8-dinitro(or dichloro)anthraquinone with *p*-toluidine, sulfonate and convert to the sodium saltNote — To obtain shades between the bluer **C.I.61710** and the redder **C.I.61800** mixtures of 1,5- and 1,8-compounds may be sulfonated (BIOS 1484, 51; FIAT 1313, 2, 221; FIAT 764 — Anthrachinon-violett)

Discoverer — O. Bally 1898

Badische Co., BP 7591/99; USP 659565, 659566; GP 106227, 108274, (*Fr.* **5**, 307, 311)

Brit. Dye. Corp., BP 271602, 308049

Schmidt, *Bull. Soc. ind. Mulhouse*, **84** (1914), 417

Houben, 452

Fierz-David, 518

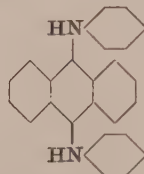
Barnett, 199

Fierz-David & Blangey, Table 18

Soluble in alcohol, Cellosolve, chloroform, *o*-chlorophenol, pyridine, toluene

Slightly soluble in acetone, benzene, carbon tetrachloride

Insoluble in Stoddard solvent

H₂SO₄ conc. — olive green; on dilution — violet**61900 Smoke Dye**

Treat anthraquinone with aniline in the presence of aluminium chloride and zinc dust

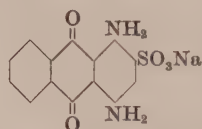
Discoverer — I.G.

Lumogen L Yellow (IG) } For colouring smokes
Smoke Yellow (IG) }

BIOS-MISC 55, 6

CIOS XXVII-84, 58; XXXII-58, App. 3

FIAT 764 — Rauchgelb

62000 Acid Dye (Bluish violet)

Condense 1-amino-4-bromo-2-anthraquinonesulfonic acid (Na salt) with aqueous ammonia

Discoverer — C. E. Müller 1924

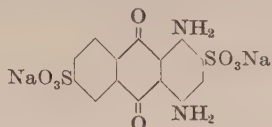
Cellit Fast Violet ER (IG)

Fastness Properties on Acetate (C): Hot pressing 1, Light 4,

Steaming (volatility) 2–3

Dischargeability poor

M.L.B., BP 228557; USP 1587669; GP 420974 (*Fr.* **15**, 876)H₂SO₄ conc. — pale helio; on dilution — bluish violet

62005 C.I. Acid Blue 56 (Reddish blue)

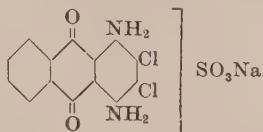
Reduce quinizarin with ammonia and hydrosulfite and follow with oxidative sulfonation

Note — A mixture of the 2,6- and 2,7-disulfonic acids appeared as Alizarin Direct Violet EBB (IG)

Discoverer — I.G. 1926

FIAT 764; *FDX* 885 (*PB* 82170) — Alizarindirektviolett EFF (EBB)

H₂SO₄ conc. — grey; on dilution — yellow

62010 C.I. Acid Violet 36 (Bluish violet)

Chlorinate 1,4-diaminoanthraquinone, sulfonate with oleum in presence of boric acid, and convert to the sodium salt

Discoverer — F. Baumann 1931

I.G., *BP* 396077; *USP* 2025370; *FP* 730230; *GP* 551182 (*Fr.* 19, 1999)

FIAT 528, 13

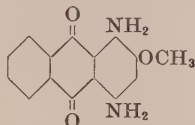
FIAT 764 — Alizarinirisol RL

Soluble in alcohol

H₂SO₄ conc. — olive; on dilution — violet

62015 C.I. Disperse Red 11 (Bright bluish pink)

C.I. Solvent Violet 26 (Bright reddish violet)



Condense 1-amino-4-bromo-2-anthraquinonesulfonic acid with *p*-toluenesulfonamide, hydrolyse, replace sulfonic acid group by OH, and methylate the latter

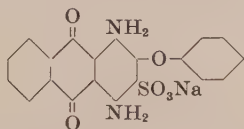
Discoverer — I.G. 1934

I.G., *BP* 402505

FIAT 1313, 2, 202

FIAT 764 — Cellitonechtrosa FF3B

H₂SO₄ conc. — reddish brown; on dilution — orange → brown ppt.

62020 C.I. Acid Violet 41 (Reddish blue → Bluish violet)

Condense 1,4-diamino-2,3-dichloroanthraquinone with phenol in the presence of sodium sulfite and manganese dioxide under pressure

Discoverers — F. Baumann and B. Stein 1932

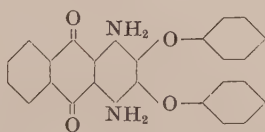
I.G., *BP* 405632; *GP* 585528 (*Fr.* 20, 1327)

BIOS 1484, 49

FIAT 764 — Anthralanviolett 4BF

Soluble in alcohol

H₂SO₄ conc. — colourless; on dilution — dull violet

62025 Solvent Dye

Condense 1,4-diamino-2,3-dichloroanthraquinone with phenol

Discoverer — A. Jacobi 1911

Mowilith Red 3B (IG) — For colouring polyvinyl acetate finishes

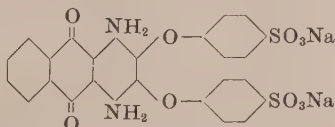
Bayer Co., *BP* 26944/11; *USP* 1038589; *FP* 447196; *GP* 263423 (*Fr.* 9, 570)

BIOS 1484, 48

FDX 885 (*PB* 74741) — Mowilithrot 3B, TBP

Soluble in alcohol

H₂SO₄ conc. — colourless; on dilution — yellowish red

62026 C.I. Acid Violet 42 (Bright violet)

Sulfonate **C.I.62025** and convert to the sodium salt

Discoverer — A. Jacobi 1911

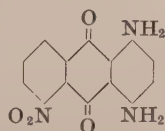
Bayer Co., *BP* 26944/11; *USP* 1038589; *FP* 447196; *GP* 263423 (*Fr.* 9, 570)

BIOS 1484, 48

FIAT 764 — Anthralanviolett 3R

Soluble in alcohol

H₂SO₄ conc. — colourless; on dilution — yellowish red

62030 C.I. Disperse Violet 8 (Bright bluish violet)

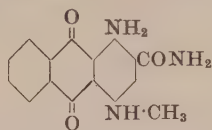
Nitrate 1,4-diaminoanthraquinone in sulfuric acid

Discoverer — I.G. 1934

BIOS 1484, 20, 62

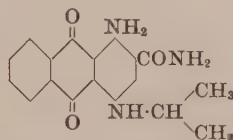
FIAT 764 — Cellitonechtviolett B, Sudanvasiolett G

H₂SO₄ conc. — brown; on dilution — bluish violet

62035 C.I. Disperse Blue 5 (Bright blue)

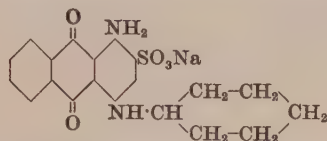
Convert 1-amino-4-methylamino-2-anthraquinonesulfonic acid to 1-amino-4-methylamino-2-anthraquinonecarbonitrile by the action of potassium cyanide, and hydrolyse the product with monohydrate

Discoverer — I.G. 1934
 BIOS 1484, 55
 FIAT 764 — Cellitonechtblau FFB

62040 Disperse Dye (Bright blue)

Condense 1-amino-4-bromo-2-anthraquinonesulfonic acid with isopropylamine. Replace the sulfonic acid group by a cyano group, and hydrolyse the latter to the carboxamide

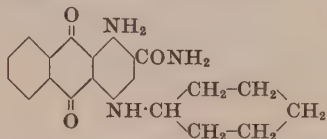
Discoverer — I.G.
 Celliton Fast Blue FBG (IG)
 FIAT 1313, 3, 76

62045 C.I. Acid Blue 62 (Bright reddish blue)

Treat 1-amino-4-bromo-2-anthraquinonesulfonic acid with cyclohexylamine and convert to the sodium salt

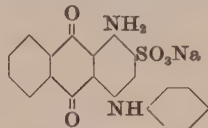
Discoverer — K. Weinand 1925
 I.G., BP 276408; GP 456114, 485521, (Fr. 16, 1304, 1306)
 BIOS 987, 149; BIOS 1157, 9
 BIOS 1484, 30; FIAT 1313, 2, 213

Soluble in alcohol
 H_2SO_4 conc. — olive green; on dilution — brownish orange

62050 C.I. Disperse Blue 6 (Bright blue)

Treat C.I.62045 with sodium cyanide and ammonium bicarbonate under pressure to form 1-amino-4-cyclohexylamino-2-anthraquinonecarbonitrile and hydrolyse

Discoverer — I.G. 1934
 BIOS 1484, 56
 FIAT 764 — Cellitonechtblau FFG

62055 C.I. Acid Blue 25 (Blue)

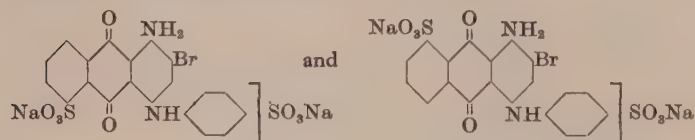
(a) Condense 1-amino-2,4-dibromoanthraquinone with aniline and heat the 1-amino-4-anilino-2-bromoanthraquinone so formed with aqueous sodium sulfite in phenol under pressure

(b) Condense 1-amino-4-bromo-2-anthraquinonesulfonic acid (Na salt) with aniline in aqueous medium using copper salts as catalyst

Discoverer — Agfa 1913
 Agfa, BP 10378/14; GP 280646 (Fr. 12, 453)
 Bayer Co., FP 473208; GP 288878 (Fr. 12, 453)
 FIAT 764 — Alizarinsaphirol A

Discoverer of use as dye for acetate — C. E. Müller 1924
 M.L.B., BP 228557; USP 1587669; GP 420974 (Fr. 15, 876)
 BIOS 987, 149; BIOS 1157, 9; BIOS 1484, 41
 Fierz-David, Suppl. 77
 Fierz-David & Blangey, Table 19

Soluble in acetone, alcohol
 Slightly soluble in benzene, tetrahydronaphthalene
 Insoluble in nitrobenzene, xylene
 H_2SO_4 conc. — dull blue; on dilution — blue ppt.

62060 Acid Dye (Blue)

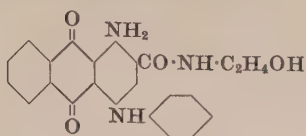
Nitrate 1-anthraquinonesulfonic acid to a mixture of the 5- and 8-nitro compounds. Reduce with sodium sulfide and dibrominate. Condense with aniline or *p*-toluidine, sulfonate and convert to the sodium salt

Note — The dye derived from aniline yields redder shades than that from *p*-toluidine

Discoverers — E. Hepp and C. Hartmann 1903
 Alizarine Direct Blue B (MLB)

Wool and silk dyed from an acetic acid dyebath
 Fastness Properties (C): Light 2, Alkaline Milling 2-3,
 Perspiration 2-3, Washing 3
 M.L.B., BP 8905/03; USP 734866; FP 338756; GP 183395
 (Fr. 8, 312)
 Badische Co., USP 749913; GP 148306 (Fr. 7, 215)
 I.G., BP 314144
 Houben, 451, 452, 477
 Fierz-David, 515

Soluble in alcohol
 H_2SO_4 conc. — dull blue; on dilution — red → violet → blue ppt.

62065 C.I. Disperse Blue 28 (Bright blue)

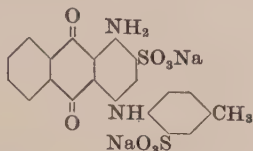
Convert 1-amino-4-bromo-2-anthraquinonecarboxylic acid to the ethanolamide via the acid chloride, and condense with aniline

Discoverers — G. H. Ellis and F. Brown 1938

SRA Fast Blue FSI (BrC)

Brit. Celanese, BP 518725; USP 2294968

Soluble in acetone, alcohol, benzene

62070 C.I. Acid Blue 145 (Blue)

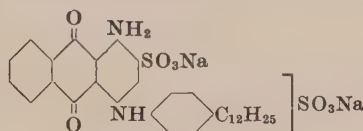
Treat 1-amino-2-bromo-4-(2-sulfo-*p*-toluidino)anthraquinone with sodium sulfite

Discoverer — P. Thomaschewski 1914

Bayer Co., GP 288878 (Fr. 12, 453)

FIAT 764 — Alizarinreinblau FFG

Soluble in alcohol, Cellosolve
Insoluble in benzene, carbon tetrachloride, Stoddard solvent
H₂SO₄ conc. — blue; on dilution — paler

62075 C.I. Acid Blue 138 (Blue)

Treat 1-amino-2,4-dibromoanthraquinone with *p*-dodecylaniline and then with sodium sulfite, sulfonate and convert to the sodium salt

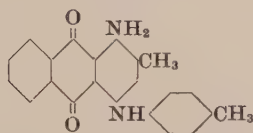
Discoverer — I.C.I. 1933

I.C.I., BP 430160, 437266, 443776, 443835, 449010, 449011, 449012, 452203, 477535, 483325, 484000; SwissP 187434

Harris, Marriott & Smith, JCS, (1936), 1838

Smith & Reid, Chem. & Ind. (1948), 678

Venkataraman, 858

62080 C.I. Solvent Blue 13 (Reddish blue)

Condense 1-amino-4-bromo(or chloro)-2-methylantraquinone with *p*-toluidine

Discoverer — M. H. Isler 1900

Badische Co., BP 20718/00; USP 715662; FP 307912; GP 131873 (Fr. 6, 406)

BIOS 1484, 31; FIAT 1313, 2, 224

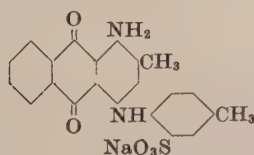
Römer & Link, Ber. 16 (1883), 695

Fierz-David, 516

Houben, 454

Fierz-David & Blangey, Table 21

H₂SO₄ conc. — violet; on dilution — violet ppt

62085 C.I. Acid Blue 47 (Blue)

Sulfonate C.I.62080 and convert to the sodium salt

FIAT 764 — Cyananthrol RXO "F"

Soluble in alcohol, *o*-chlorophenol
Slightly soluble in acetone, pyridine
Insoluble in chloroform, toluene
H₂SO₄ conc. — violet; on dilution — violet

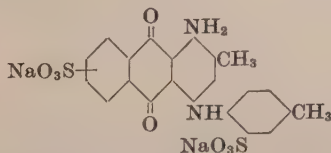
62090 Acid Dye (Greenish blue)

Sulfonate C.I.62080 in presence of boric acid and convert to the sodium salt

Discoverer — M. H. Isler 1901

Badische Co., GP 132622 (Fr. 6, 409)

Slightly soluble in alcohol
H₂SO₄ conc. — reddish violet; on dilution — red → reddish violet soln.

62095 C.I. Acid Blue 49 (Blue)

Disulfonate C.I.62080 and convert to the sodium salt

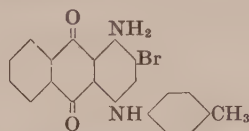
Discoverer — M. H. Isler 1900

Badische Co., FP 307912; GP 132622 (Fr. 6, 409)

FIAT 1313, 2, 225

FIAT 764 — Cyananthrol RBX

Soluble in alcohol
H₂SO₄ conc. — dull violet; on dilution — bluish violet

62100 C.I. Solvent Blue 12 (Blue)

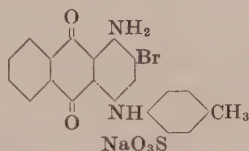
Condense 1-amino-2,4-dibromoanthraquinone with *p*-toluidine

Discoverer — O. Unger 1899

Bayer Co., BP 19531/99; USP 654294, 654295; FP 293497; GP 115048, 126392, (Fr. 6, 325, 360)
 Brit. Dye. Corp., BP 271602, 308049
 CIOS XXXII-58, App. 6; BIOS 1484, 38; FIAT 1313, 2, 216
 FIAT 764 — Rauchblau R
 Friedländer & Schick, Z. Farb. u. Textilchem. 3 (1904), 220
 Schmidt, Bull. Soc. ind. Mulhouse, 84 (1914), 409
 Ullmann & Eiser, Ber. 49 (1916), 2165
 Houben, 477
 Fierz-David, 515
 Barnett, 198, 204
 Fierz-David & Blangey, 233, Table 19

Solubilities. See Solvent section (Vol. 2, p. 2876)

H₂SO₄ conc. — bluish black; on dilution — bright blue ppt.

62105 C.I. Acid Blue 78 (Blue)

Sulfonate C.I.62100 with monohydrate and convert to the sodium salt

Discoverer and references as for C.I.62100

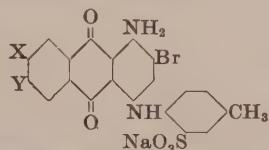
Additional reference — FIAT 764 — Alizarinreinblau B

Soluble in alcohol, *o*-chlorophenol, pyridine

Slightly soluble in acetone, Cellosolve

Insoluble in benzene, carbon tetrachloride, chloroform, Stoddard solvent, toluene

H₂SO₄ conc. — deep blue; on dilution — redder

62110 C.I. Acid Blue 96 (Dull blue)

X or Y = SO₃Na

Sulfonate C.I.62105 with oleum in the presence of boric acid to form a disulfonic acid and convert to the sodium salt

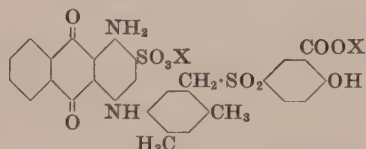
Alizarine Sky Blue G (IG)

BIOS 1484, 39; FIAT 1313, 2, 232

FIAT 764 — Alizarinreinblau G

Soluble in alcohol

H₂SO₄ conc. — dull blue; on dilution — blue

62115 Mordant Dye

X = Na or NH₄

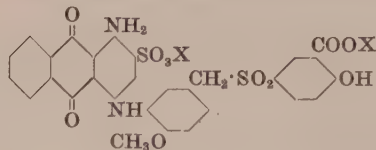
Condense 1-amino-4-bromo-2-anthraquinonesulfonic acid with 5-(5-amino-2,4-dimethylbenzylsulfonyl)salicylic acid and convert to the sodium or ammonium salt

Discoverer — I.G.

Alizarin Chrome Blue FFR (IG)

I.G., GP 632376 (Fr. 23, 969)

FIAT 1313, 2, 238

62120 C.I. Mordant Blue 48 (Chromium-Bright blue)

X = Na or NH₄

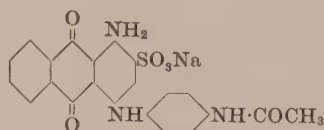
Condense 1-amino-4-bromo-2-anthraquinonesulfonic acid with 5-(3-amino-4-methoxybenzylsulfonyl)salicylic acid and convert to the sodium or ammonium salt

Discoverers — G. Kränzlein, E. Diefenbach, E. Fischer, E. Honold, F. Eggert, and H. Kraus 1934

I.G., GP 632376 (Fr. 23, 969)

BIOS 1239, 21; BIOS-MISC 20, App. 59; FIAT 1313, 2, 238

FIAT 764 — Alizarinchromblau FFG

62125 C.I. Acid Blue 40 (Greenish blue)

Condense 1-amino-4-bromo-2-anthraquinonesulfonic acid with *p*-aminoacetanilide in presence of copper salts and acid-binding agents and convert to the sodium salt

Discoverer — Agfa 1913

Agfa, BP 10378/14; GP 280646 (Fr. 12, 453)

BIOS 987, 133, 135

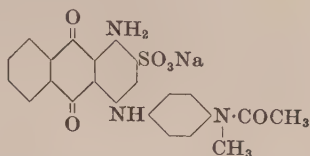
FIAT 764 — Alizarindirektblau A2G, Anthralanblau G

Soluble in acetone, alcohol

Slightly soluble in nitrobenzene

Insoluble in benzene, xylene

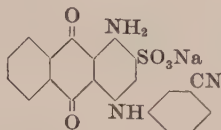
H₂SO₄ conc. — bluish green

62130 C.I. Acid Blue 41 (Blue)

Condense 1-amino-4-bromo-2-anthraquinonesulfonic acid with *p*-amino-*N*-methylacetanilide in presence of copper salts and acid-binding agents and convert to the sodium salt

Discoverers — G. Kränzlein, E. Kronholz, and F. Römer 1926
I.G., BP 282409; USP 1750227, 1750228; GP 469565 (Fr. 16, 1306)
BIOS 987, 133, 135; BIOS 1157, 9
FIAT 764 — Alizarindirektblau AR, Anthralanblau B

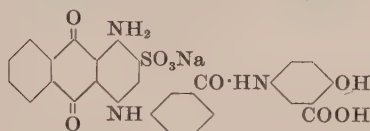
H₂SO₄ conc. — dull fawn; on dilution — pink

62135 C.I. Acid Blue 53 (Blue)

Treat 1-amino-4-bromo-2-anthraquinonesulfonic acid with *m*-aminobenzonitrile in presence of copper and sodium carbonate

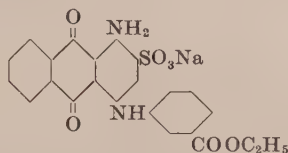
Discoverer — K. Weinand 1929
I.G., BP 332203; USP 1840420; GP 511043 (Fr. 17, 1194)
FIAT 764 — Anthralanblau R

Soluble in alcohol
H₂SO₄ conc. — pale blue; on dilution — blue

62140 Mordant Dye (Chromium-Bright blue)

Condense 1-amino-4-bromo-2-anthraquinonesulfonic acid with 5-(*m*-aminobenzamido)salicylic acid and convert to the sodium salt

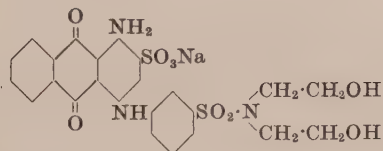
Discoverer — I.G.
Chrome Brilliant Blue BL (IG)
I.G., GP 632376 (Fr. 23, 969)
BIOS-MISC 20, App. 60; FIAT 1313, 2, 239

62145 C.I. Acid Blue 51 (Blue)

Condense 1-amino-4-bromo-2-anthraquinonesulfonic acid
(a) with *m*-aminobenzoic acid and ethylate the product with ethanol and sulfuric acid. Convert to the sodium salt
or (b) with *m*-aminobenzoic acid ethyl ester in the presence of sodium bicarbonate and cuprous chloride

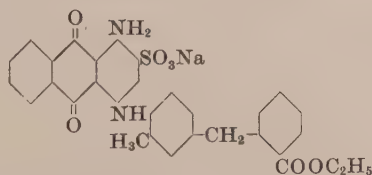
Discoverers — G. Kränzlein and E. Diefenbach 1930
I.G., BP 355810; USP 1902084; GP 555966 (Fr. 19, 1990)
BIOS 987, 138
FIAT 764 — Alizarinreinblau FFB

Soluble in alcohol, Cellosolve
Insoluble in benzene, carbon tetrachloride, Stoddard solvent
H₂SO₄ conc. — dull greenish blue; on dilution — reddish blue solution and ppt.

62150 Acid Dye

Condense 1-amino-4-bromo-2-anthraquinonesulfonic acid with *N*¹,*N*¹-bis(2-hydroxyethyl)metanilamide and convert to the sodium salt

Discoverers — E. Diefenbach and E. Fischer 1934
Anthralan Blue FR (IG)
Applied from a Glauber's salt-sulfuric acid bath. Levelling 5
Fastness Properties (C): Carbonising 4, Light 5-6, Milling 2, Perspiration 2, Washing 2
I.G., BP 454959; USP 2029258; GP 639729 (Fr. 23, 958)
FIAT 1313, 2, 227
FIAT 764 — Anthralanblau FR

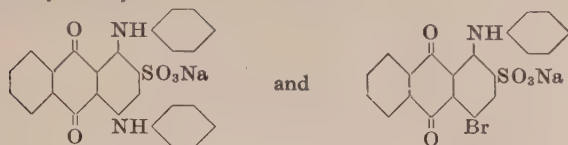
62155 C.I. Acid Blue 111 (Bright blue)

Condense 1-amino-4-bromo-2-anthraquinonesulfonic acid with α -(4-amino-*m*-tolyl)-*o*-toluic acid ethyl ester in the presence of cuprous chloride and acid-binding agents. Convert to the sodium salt

Discoverers — G. Kränzlein and E. Diefenbach 1930
I.G., BP 355810; USP 1902084; GP 553001, 554324, 555966 (Fr. 19, 1987, 1989, 1990)
BIOS 987, 133, 150; FIAT 1313, 2, 228
FIAT 764 — Supranolbrillantblau G

62520 Acid Dye

Probably mainly



Treat aniline with the 1-diazo compound of 1-amino-4-bromo-2-anthraquinonesulfonic acid and convert the product to the sodium salt

Discoverer — I.G. 1929

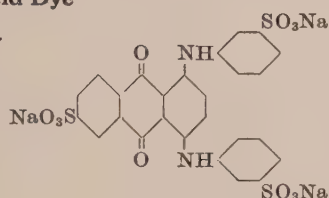
Alizarine Cyanol Grey G (IG)

Applied from a Glauber's salt-sulfuric acid bath. Levelling 4
Fastness Properties (C): Carbonising 4, Light 5, Milling 2-3,
Perspiration 4, Washing 2

FIAT 764, FDX 885 (PB 82170) — Alizarincyanolgrau G

62530 Acid Dye

Probably



Condense 5,8-dichloro-2-anthraquinonesulfonic acid with metanilic acid and convert to the sodium salt

Discoverer — O. Bally 1907

Anthraquinone Blue Green BX (B)

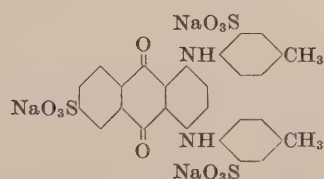
Wool and silk dyed from a sulfuric acid bath, rendered faster to milling by afterchroming with little or no change in hue. Levelling moderate

Fastness Properties: Carbonising, good; Light, very good-excellent; Milling, fairly good-good; Perspiration, good; Washing, fairly good-good (C.I.1082 (1st Edn.) — unconfirmed)

Badische Co., BP 27187/07; FP 384471; GP 206645, 216071, (Fr. 9, 720, 677)

Marvin, USP 1580265

Insoluble in alcohol

H₂SO₄ conc. — dull blue; on dilution — green**62535 Acid Dye**

Condense 5-nitro-2-anthraquinonesulfonic acid with *p*-toluidine; brominate the 5-*p*-toluidino-2-anthraquinonesulfonic acid so formed and condense again with *p*-toluidine. Sulfonate with 100% sulfuric acid and convert to the sodium salt

Discoverer — O. Bally 1900

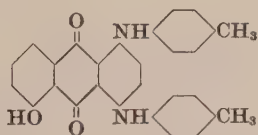
Anthraquinone Green GX (B)

Wool and silk dyed from a sulfuric acid bath, rendered faster to milling by afterchroming with little or no change in hue. Levelling good

Fastness Properties: Carbonising, good; Light, very good-excellent; Milling, fairly good-good; Perspiration, good; Washing, fairly good-good (C.I.1081 (1st Edn.) — unconfirmed)

Badische Co., BP 25080/99, 10316/00; USP 656081, 723125; FP 294887; GP 113011 (Fr. 6, 309), 151384 (Fr. 7, 221)

Slightly soluble in alcohol

H₂SO₄ conc. — dull reddish blue; on dilution — green ppt.**62545 Solvent Dye**

Condense 1,4,5-trihydroxyanthraquinone with *p*-toluidine

Discoverer — R. E. Schmidt 1904

Sudan Green BB (IG)

Solvent dye for oils, fats and waxes

Bayer Co., BP 9138/05; USP 812599, 812684; FP 353549, 354076; GP 166433, 170113, (Fr. 8, 327, 329). See also BP 23927/94; FP 243315; GP 86150 (Fr. 4, 308)

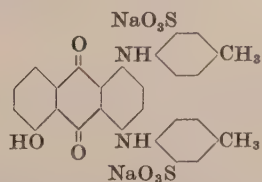
M.L.B., USP 778036

BIOS 1484, 33; FIAT 1313, 2, 231, 237

FIAT 764 — Sudangruen BB

Schmidt, Bull. Soc. chim. 15 (1914) 4, Suppl. 34

Fierz-David, 23

62550 C.I. Acid Green 38 (Green)*

Sulfonate C.I.62545 with monohydrate in the presence of boric acid and convert to the sodium salt

* Chromium-Green

Discoverer and references as for C.I.62545

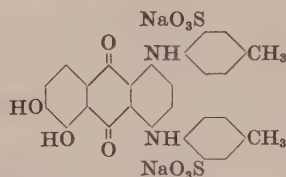
Additional references —

Bayer Co., BP 23927/94; FP 243316; GP 84509 (Fr. 4, 325)

FIAT 764 — Brillantalizarinviridin F

Slightly soluble in alcohol

H₂SO₄ conc. — dull green; on dilution — green

62555 Acid Dye (Bluish green)

Condense **C.I.58500** or its leuco-compound with 2 mol. *p*-toluidine in presence of boric acid, sulfonate and convert to the sodium salt

Discoverer — R. E. Schmidt 1894

Bayer Co., *BP* 23927/94, 9138/05; *USP* 812599, 812684; *FP* 243315, 243316, 354076; *GP* 84509, 86150, 91150, 91152, 92591, (*Fr.* 4, 325, 308, 316, 318, 319), 166433 (*Fr.* 8, 327)

M.L.B., *USP* 734325

BIOS 1484, 44; *FIAT* 1313, 2, 225

FIAT 764 — Alizarinviridin FF

Schmidt, *Bull. Soc. chim.* 15 (1914) 4, Suppl. 34

Kerth, *Ber.* 18 (1937), 378

Barnett, 205

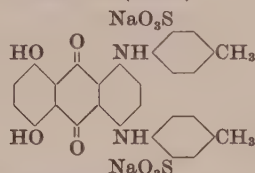
Fierz-David, 522

Houben, 443, 455

Fierz-David & Blangey, Table 20

Slightly soluble in alcohol

H₂SO₄ conc. — dull green; on dilution — green

62560 C.I. Acid Green 41 (Green)

(a) Condense *p*-toluidine with leuco-1,4,5,8-tetrahydroxyanthraquinone in the presence of arsenic and boric acids. Sulfonate and convert to the sodium salt

(b) Condense *p*-toluidine with 5,8-dichloroquinizarin, sulfonate and convert to the sodium salt

Discoverer — K. Weinand 1925

Bayer Co., *BP* 263370; *USP* 1713576; *FP* 616051; *GP* 445846 (*Fr.* 15, 677). Sulfonation only — *GP* 435478 (*Fr.* 15, 678)

BIOS 1484, 35

FIAT 764 — Alizarincyaningruen 5G

Soluble in acetone, alcohol, Cellosolve, *o*-chlorophenol, pyridine
Insoluble in benzene, carbon tetrachloride, chloroform, Stoddard solvent, toluene

H₂SO₄ conc. — green; on dilution — pale green

Na₂S₂O₄, alkaline — red

62565 Solvent Dye

Dicyclohexylamine salt analogous to **C.I.62560**

Spirit Fast Green G (IG)

Dye for alcoholic solvents suitable for spirit, phenol/formaldehyde, and nitro-cellulose lacquers

FDX 885 (*PB* 74773) — Spritechtgrün G

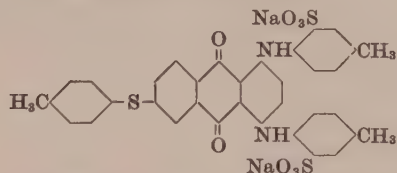
62570 Solvent Dye

1-Naphthylamine salt analogous to **C.I.62560**

Spirit Fast Green 3G (IG)

Dye for alcoholic solvents

FDX 885 (*PB* 74773) — Spritechtgrün 3G

62575 C.I. Acid Green 42 (Dull green)

Condense *p*-toluidine with 1,4,6-trichloroanthraquinone to form 6-chloro-1,4-di-*p*-toluidinoanthraquinone. Treat the product with *p*-toluenethiol, sulfonate and convert to the sodium salt

Discoverers — B. Stein and W. Kühne 1935

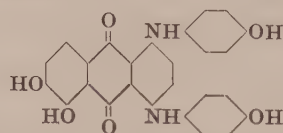
Alizarine Cyanine Green 3GW (IG)

I.G., *BP* 466714; *USP* 2091657; *FP* 812484; *GP* 646499 (*Fr.* 24, 806)

FIAT 764 — Alizarincyaningruen 3GW

Soluble in alcohol

H₂SO₄ conc. — dull bluish green; on dilution — green

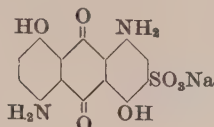
62580 Disperse Dye

Treat 1,2,5,8-tetrahydroxyanthraquinone with *p*-aminophenol.

Discoverer — I.G.

Perlon Fast Green BT (IG)

BIOS 1120, 15; *BIOS-MISC* 20, 30

63000 C.I. Acid Blue 43 (Blue)*

(a) Reduce 4,8-diamino-1,5-dihydroxy-2,6-anthraquinonedisulfonic acid, oxidise the leuco compound of the 4,8-diamino-1,5-dihydroxy-2-anthraquinonesulfonic acid so formed and convert to the sodium salt

(b) Sulfonate 4,8-diamino-1,5-dihydroxyanthraquinone with slightly fuming sulfuric acid at 120–130°C

(c) Reduce 1,5-dihydroxy-4,8-dinitro-2,6-anthraquinonedisulfonic acid with sodium sulfide

(d) Treat 1,5-dimethoxy-4,8-dinitroanthraquinone with sodium sulfite and hydrolyse with 70% sulfuric acid

(e) Monosulfonate 4,8-diamino-1,5-dihydroxyanthraquinone in oleum in the presence of boric acid

(f) Partially de-sulfonate **C.I.63010** with reducing agents

* Chromium–Greenish blue

Discoverer — R. E. Schmidt 1897

Bayer Co., *BP* 12011/97, 17202/99, 17206/99, 5841/07; *FP* 266999, 376109; *GP* 108578, 110880, (*Fr.* 5, 252, 254), 117892, 119228, (*Fr.* 6, 347, 351), 152013 (*Fr.* 7, 200), 190476 (*Fr.* 9, 712)

BIOS 1484, 42; *FIAT* 1313, 2, 213

FIAT 764 — Alizarinsaphirol SE

Barnett, 190, 283

Fierz-David, 521

Houben, 447, 451

Kränzlein, 37

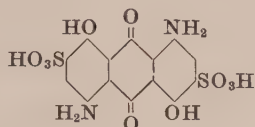
Kerth, Ber. 18 (1937), 378

Fierz-David & Blangey, 319, Table 18

Slightly soluble in alcohol, Cellosolve

Insoluble in acetone, benzene, carbon tetrachloride, Stoddard solvent

H₂SO₄ conc. — yellowish olive; on dilution — violet

63005 C.I. Solvent Blue 74

Acidify **C.I.63010** with hydrochloric acid

Discoverer — R. E. Schmidt 1897

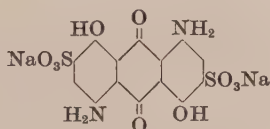
Bayer Co., *BP* 12011/97, 19622/97, 20649/97, 7708/99, 16574/99, 7291/00; *USP* 623219, 623220; *FP* 266999; *GP* 96364, 100136, 100137, 103395, 105501, 106034, 108362, (*Fr.* 5, 246, 247, 249, 252, 250, 255, 251), 113724, 116746, (*Fr.* 6, 348, 350), 163647 (*Fr.* 8, 310), 195139 (*Fr.* 9, 713)

Agfa, GP 280646, 288665, 288878, (*Fr.* 12, 453, 454, 453)

I.G., GP 445269, 446563, (*Fr.* 15, 671, 673)

BIOS 1484, 63; *BIOS* 1661, 76; *FIAT* 1313, 2, 213

FIAT 764 — Helioechtblau BL

63010 C.I. Acid Blue 45 (Blue)

(a) Sulfonate 1,5-dihydroxyanthraquinone, nitrate the disulfonic acid formed and reduce with sodium sulfide

(b) Treat 2,6-dibromo(or dichloro)-1,5-dihydroxy-4,8-dinitroanthraquinone with sodium bisulfite

(c) Treat 4,8-dibromo(or dichloro)-1,5-dihydroxy-2,6-anthraquinonedisulfonic acid with ammonia in presence of copper

Discoverer — R. E. Schmidt 1897

Bayer Co., *BP* 12011/97, 19622/97, 20649/97, 7708/99, 16574/99, 7291/00; *USP* 623219, 623220; *FP* 266999; *GP* 96364, 100136, 100137, 103395, 105501, 106034, 108362, (*Fr.* 5, 246, 247, 249, 252, 250, 255, 251), 113724, 116746, (*Fr.* 6, 348, 350), 163647 (*Fr.* 8, 310), 195139 (*Fr.* 9, 713)

Agfa, GP 280646, 288665, 288878, (*Fr.* 12, 453, 454, 453)

I.G., GP 445269, 446563, (*Fr.* 15, 671, 673)

BIOS 1484, 41; *BIOS* 1661, 77; *FIAT* 1313, 2, 211

FIAT 764 — Alizarinsaphirol B

Barnett, 190, 283

Fierz-David, 520

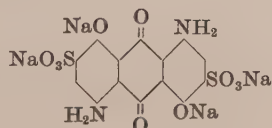
Houben, 32, 296, 413, 447

Fierz-David, Suppl. 78

Slightly soluble in alcohol, Cellosolve

Insoluble in acetone, alcohol, benzene, carbon tetrachloride, Stoddard solvent

H₂SO₄ conc. — yellowish olive; on dilution — bluish violet

63011 Acid Dye

Prepare as **C.I.63010**. The separation of the tetra sodium salt follows immediately after the alkaline reduction of the dihydroxydinitroanthraquinonedisulfonic acid

Discoverer — R. E. Schmidt 1897

Alizarine Saphirol R (IG)

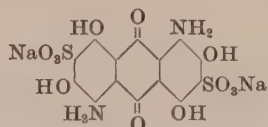
References as **C.I.63010**

Additional references —

BIOS 1661, 76; *FIAT* 1313, 2, 212

Slightly soluble in alcohol

H₂SO₄ conc. — yellowish olive; on dilution — reddish blue

63015 Mordant Dye

(a) Reduce 1,3,5,7-tetrahydroxy-4,8-dinitro-2,6-anthraquinonedisulfonic acid and convert to the sodium salt

(b) Heat 1,5-dinitroanthraquinone with fuming sulfuric acid in presence of sulfur and reduce with sulfurous acid

Discoverer — H. Laubmann 1893

Acid Alizarin Blue GR (MLB)

Reddish blue on aluminium- and blue on chromium-mordanted wool

M.L.B., BP 13395/93; FP 231479; GP 73684 (Fr. 3, 246)

Bayer Co., BP 19009/95; FP 281125; GP 105567 (Fr. 5, 277), 115002 (Fr. 6, 344)

Schmidt & Gattermann, Ber. 29 (1896), 2934

Schmidt, Bull. Soc. ind. Mulhouse, 84 (1914), 409
Barnett, 246

Houben, 313, 451

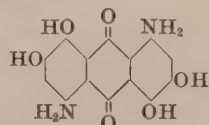
Slightly soluble in water (violet red)

Insoluble in alcohol

H₂SO₄ conc. — brownish red; on dilution — red

63020 Mordant Dye (Chromium-Blue)

Probably a mixture containing



Treat the intermediate quinone formed in the preparation of C.I.58550 with ammonia

Discoverer — R. E. Schmidt 1890

Alizarin Cyanine G (By)

Fastness Properties (C): Carbonising 4-5, Decatising 3-4, Light 6, Milling 3-4, Potting 2, Stoving 5, Washing 4
Bayer Co., BP 17712/90, 4871/91; USP 476419; FP 206564; GP 62019, 62505, 68113, (Fr. 3, 235, 214, 219)

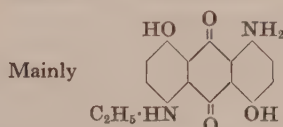
Schmidt, J. prakt. Chem., 43 (1891), 245

Houben, 446

Soluble in alcohol (bluish violet)

Insoluble in water

H₂SO₄ conc. — red; on dilution — dark red ppt.

63295 Disperse Dye (Bright blue)

Ethylate 1,5-diamino-4,8-dimethoxyanthraquinone with ethyl chloride in alcoholic solution and hydrolyse

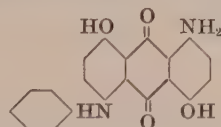
Discoverer — I. G.

Celliton Fast Blue R (IG)

Fastness Properties (C): Hot pressing 4, Light 3-4, Steaming (volatility) 3

Dischargeability poor

FDX 885 (PB 74706) — Cellitonechtblau R

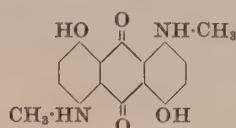
63300 Disperse Dye (Blue)

Treat 1,5-dihydroxy-4,8-dinitroanthraquinone with aniline and reduce

Discoverer — Brit. Celanese 1933

SRA Fast Blue XIII (BrC)

Brit. Celanese, BP 420593; USP 2053274

63305 C.I. Disperse Blue 26 (Bright blue)

(a) Treat 1,5-dihydroxy-4,8-dinitroanthraquinone with methylamine

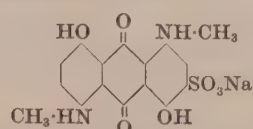
(b) Methylate 1,5-diamino-4,8-dihydroxyanthraquinone with dimethyl sulfate in sulfuric acid

Discoverers — J. Baddiley and A. Shepherdson 1923

Brit. Dye. Corp., BP 211720, 224077, 246984; USP 1534019, 1616103

Soluble in acetone, alcohol, benzene, linseed oil

H₂SO₄ conc. — greenish yellow; on dilution — reddish blue

63315 C.I. Acid Blue 55 (Blue)

Condense C.I.63005 with formaldehyde in sulfuric acid, split off one sulfonic acid group and convert to the sodium salt

Discoverers — R. E. Schmidt and W. Trautner 1925

Bayer Co. (Methylation) BP 250968; USP 1702022; FP 620365; GP 443585 (Fr. 15, 670)

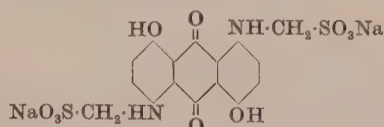
(Splitting off sulfonic acid group) BP 250968; USP 1700083; FP 620365; GP 454426 (Fr. 16, 1211)

FIAT 1313, 2, 233

FIAT 764 — Alizarinsaphirol SES

Slightly soluble in alcohol

H₂SO₄ conc. — greenish yellow; on dilution — pure blue

63320 Acid Dye (Bright blue)

Treat diaminoanthrarufin with formaldehyde and sodium bisulfite

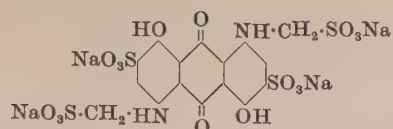
Discoverer — W. H. Perkin and A. W. Fyfe 1924

Ionamine Pure Blue R (BDC)

The N-sulfomethyl group which confers water solubility is hydrolysed off in the dyebath and the amino compound thus released dyes acetate

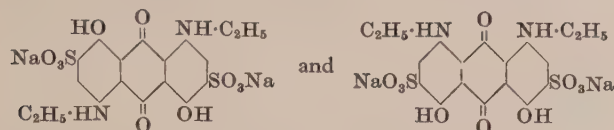
Brit. Dye. Corp., BP 238717

Soluble in water

63325 Acid Dye

Treat **C.I.63005** with formaldehyde and sodium bisulfite

Note — Similar products are obtainable by the action of formaldehyde and sodium bisulfite on **C.I.63000** and on mixtures of **C.I.63000** and **C.I.63005**

63330 C.I. Acid Blue 68 (Blue)

(a) Dinitrate, reduce, ethylate and sulfonate a mixture of 1,5- and 1,8-dimethoxyanthraquinone. The methoxy groups are hydrolysed during sulfonation. Convert to the sodium salt

(b) Condense ethylamine with 1,5-dibromo-4,8-dihydroxyanthraquinone in presence of copper and sulfonate

(c) Brominate a mixture of 1,5-dihydroxy-2,6-anthraquinone-disulfonic acid and 1,8-dihydroxy-2,7-anthraquinone-disulfonic acid. Condense with ethylamine in the presence of copper

Discoverer — M.L.B. 1893

Acilan Direct Blue EB extra (FBy)

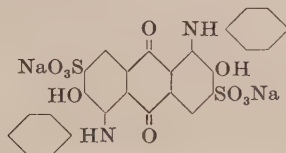
M.L.B., *GP* 77818 (*Fr.* 4, 304), 125576 (*Fr.* 6, 358), 185546 (*Fr.* 9, 711)

Bayer Co., *GP* 195139, 197082, (*Fr.* 9, 713, 689)

Note — *C.I.1055* (1st Edn.) and *GP* 197082 show an incorrect formula for the dye based on chrysazin (cf. *GP* 100136 and *Barnett*, 277)

Slightly soluble in alcohol

H₂SO₄ conc. — brownish yellow; on dilution — reddish brown → violet

63335 Mordant Dye

Condense 3,7-dihydroxy-4,8-dinitro-2,6-anthraquinonedisulfonic acid with aniline (or *p*-toluidine). Convert to the sodium salt

Discoverer — M. Iljinsky 1908

Erweco Acid Alizarin Blue R (RW)

Reddish violet on wool which, on afterchroming, turns blue
Wedekind Co., *BP* 2831/11; *USP* 996487; *GP* 235776, 244372
245014, 247245, (*Fr.* 10, 612, 614, 616, 618)

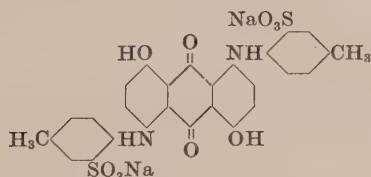
Barnett, 199

Fierz-David, 523

Houben, 456

Fierz-David & Blangey, Table 17

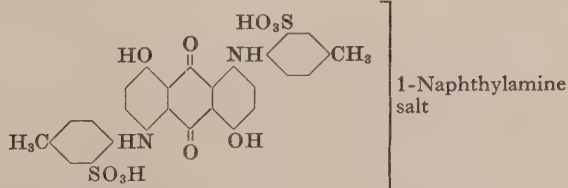
Insoluble in alcohol

63340 Acid Dye

Condense 1,5-dichloro-4,8-dihydroxyanthraquinone with *p*-toluidine, sulfonate and convert to the sodium salt

Toluidine Blue

Allen, Frame & Wilson, *J. Org. Chem.* 6 (1941), 732; 7 (1942), 68

63345 Solvent Dye

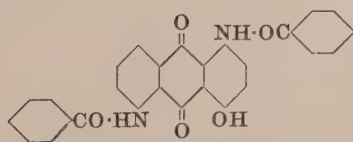
1-Naphthylamine salt

Discoverer — I.G.

Spirit Fast Blue G (IG)

Dye for alcoholic solvents

FDX 885 (*PB* 74773) — Spritichtblau G

63350 C.I. Pigment Red 85 (Bordeaux)

Oxidise 1,5-dibenzamidoanthraquinone with fuming sulfuric acid with or without addition of manganese dioxide

Discoverer — J. Deinet 1909

Formerly used as a vat dye — **Algol Brilliant Red BB (By)**

Bayer Co., *BP* 2702/09, 5786/09, 4608/11; *USP* 957042;
FP 400653, 404345; *GP* 213500, 225232, (*Fr.* 9, 747, 1197),
238488 (*Fr.* 10, 646)

Vlies, *JSDC*, 30 (1914), 29

Houben, 460

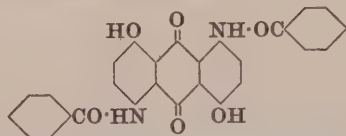
Fierz-David, 574

Barnett, 215

Soluble in tetrahydronaphthalene, xylene

H₂SO₄ conc. — crimson; on dilution — crimson ppt.

Na₂S₂O₄, alkaline — reddish brown; acid — orange

63355 C.I. Vat Violet 15 (Violet)

Condense 1,5-diamino-4,8-dihydroxyanthraquinone with benzoyl chloride in nitrobenzene or *o*-dichlorobenzene

Discoverer — J. Deinet 1909

Bayer Co., *BP* 2702/09; *USP* 935590, 957042; *FP* 400653; *GP* 225232 (*Fr.* 9, 1197)

BIOS 1493, 8

FIAT 764 — Indanthrenbrillantviolett BBK

Vlies, *JSDC*, 30 (1914), 29

Fox, *JSDC*, 65 (1949), 511

Kunz, *Text-Rund.* 6 (1951), 541; *Melliand.* 33 (1952), 64

Barnett, 215, 218

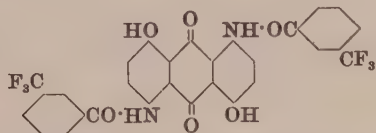
Fierz-David, 575

Houben, 459

Soluble in pyridine, xylene

H_2SO_4 conc. — bluish green, yellow on heating; on dilution — violet ppt.

$\text{Na}_2\text{S}_2\text{O}_4$, alkaline — reddish brown; acid — dull red

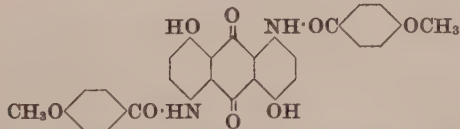
63360 Vat Dye

Condense 1,5-diamino-4,8-dihydroxyanthraquinone with *m*-(trifluoromethyl)benzoyl fluoride

Discoverer — I.G.

Indanthren Brilliant Violet F3RK (IG)

FIAT 1313, 3, 47, 90

63365 C.I. Vat Violet 17 (Violet)

Condense 1,5-diamino-4,8-dihydroxyanthraquinone with *p*-anisoyl chloride

Note — Commercial products may contain one benzoyl and one anisoyl group

Discoverer — P. Thomaschewski 1908

Bayer Co., *BP* 2702/09; *USP* 957125; *FP* 400653; *GP* 223510 (*Fr.* 10, 641), 225232 (*Fr.* 9, 1197), 226940 (*Fr.* 10, 649)

FIAT 764 — Indanthrenbrillantviolett RK

Vlies, *JSDC*, 30 (1914), 29

Kunz, *Melliand.* 33 (1952), 64

Barnett, 214

Fierz-David, 574, 575 (corrected in Suppl. 80)

Houben, 459

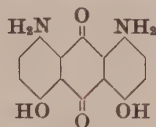
Thorpe, 1, 416

Soluble in pyridine, tetrahydronaphthalene, xylene

H_2SO_4 conc. — brownish red → green → yellowish green; on dilution — violet ppt.

$\text{H}_2\text{SO}_4 + \text{H}_3\text{BO}_3$ — bright bluish green → blue

$\text{Na}_2\text{S}_2\text{O}_4$, alkaline — reddish brown; acid — dull reddish violet

63600 Disperse Dye (Bright reddish blue)

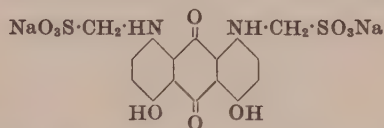
Nitrate 1,8-dihydroxyanthraquinone and reduce with sodium sulfide

Discoverer — Brit. Dye. Corp. 1923

Brit. Dye. Corp., *BP* 211720, 224077, 246984; *USP* 1534019, 1616103

Slightly soluble in acetone, alcohol, benzene, linseed oil

H_2SO_4 conc. — yellowish green; on dilution — violet

63605 Acid Dye (Bright blue)

Treat C.I.63600 with formaldehyde and sodium bisulfite

Discoverers — W. H. Perkin and A. W. Fyfe 1924

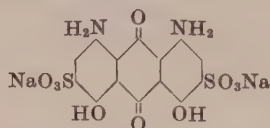
Ionamine Pure Blue G (BDC)

The *N*-sulfomethyl group which confers water solubility is hydrolysed off in the dyebath and the amino compound thus released dyes acetate

Brit. Dye. Corp., *BP* 238717

Thorpe, 1, 40

Soluble in water

63610 C.I. Acid Blue 69 (Blue)

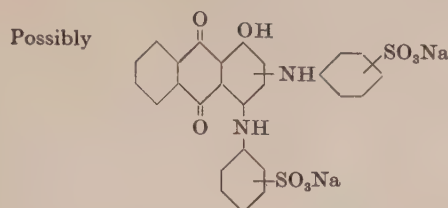
Nitrate 1,8-dihydroxyanthraquinone in oleum and reduce with sodium sulfide

Discoverer — I.G.

FIAT 1313, 2, 233

FIAT 764 — Alizarinsaphirol WS

H_2SO_4 conc. — greenish yellow; on dilution — violet

63615 C.I. Mordant Black 13 (Chromium–Bluish grey → Black)

(a) Condense purpurin with aniline in presence of boric acid, sulfonate with monohydrate and convert to the sodium salt

(b) Condense 2-chloro(or bromo)-1,4-dihydroxyanthraquinone with aniline and sulfonate

* Chromium — Bluish grey → Black

Discoverers — R. E. Schmidt and P. Tust 1894

Bayer Co., BP 23927/94, 8635/98; FP 243315, 243316; GP 84505, 86150, (Fr. 4, 325, 308), 114199 (Fr. 6, 366), 145239 (Fr. 7, 197)

BIOS 1484, 26; FIAT 1313, 2, 210

FIAT 764 — Alizarinblauschwarz B

Schmidt, *Bull. Soc. chim.* 15 (1914) (4), Suppl. xxxiii

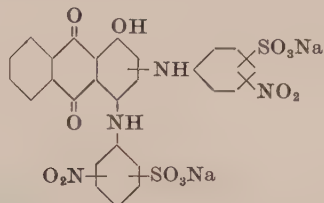
Barnett, 205

Soluble in Cellosolve

Slightly soluble in acetone, alcohol, *o*-chlorophenol, pyridine

Insoluble in benzene, carbon tetrachloride, chloroform, Stoddard solvent, toluene

H₂SO₄ conc. — violet; on dilution — violet ppt.

63620 C.I. Mordant Black 57 (Chromium–Black)

Nitrate C.I.63615

Discoverer — K. Thun 1898

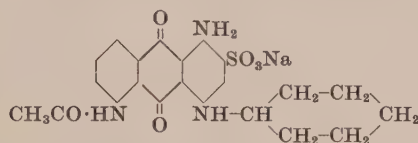
Bayer Co., GP 103396 (Fr. 5, 299)

BIOS 1484, 36; FIAT 1313, 2, 236

FIAT 764 — Alizarinechtschwarz T

Soluble in alcohol

H₂SO₄ conc. — dull violet; on dilution — pale brown

64005 C.I. Acid Blue 124 (Bright reddish blue)

Condense 5-acetamido-1-amino-4-bromo-2-anthraquinonesulfonic acid with cyclohexylamine and convert to the sodium salt

Discoverers — K. Weinand, K. Bamberger, and H. Utsch 1933

Alizarine Brilliant Sky Blue G (IG)

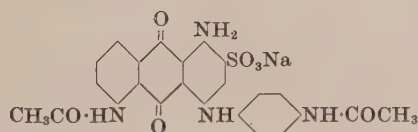
I.G., BP 432647; USP 2001044; FP 767655; GP 602904 (Fr. 21, 1056)

BIOS 1484, 28

FIAT 764 — Alizarinbrillantreinblau G

Slightly soluble in alcohol

H₂SO₄ conc. — pale lemon yellow; on dilution — brownish orange

64010 Acid Dye

Condense 5-acetamido-1-amino-4-bromo-2-anthraquinonesulfonic acid with *p*-aminoacetanilide and convert to the sodium salt

Discoverer — I.G. 1933

Alizarine Direct Blue 6G (IG)

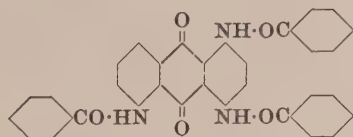
Applied from a Glauber's salt–sulfuric acid bath. Levelling 3–4 Fastness Properties (C): Carbonising 4, Light 5–6, 6, 6, Milling 2–3, Perspiration 3–4, Washing 3

I.G., BP 432647; USP 2001044; FP 767655; GP 602904 (Fr. 21, 1056)

BIOS 1484, 35

FIAT 764 — Alizarindirektblau 6G

H₂SO₄ conc. — pale green; on dilution — pink → blue

64015 C.I. Vat Red 19 (Bluish red)

Benzoylate 1,4,5-triaminoanthraquinone

Discoverer — J. Deinet 1909

Bayer Co., BP 2702/09, 3055/09; FP 400653, 404190; GP 216772, 225232, (Fr. 9, 747, 1197), 226940 (Fr. 10, 649)

Bradley, *JSDC*, 58 (1942), 5

Barnett, 218

Fierz-David, 576

Houben, 458

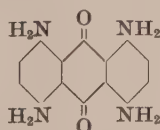
Thorpe, 1, 416

H₂SO₄ conc. — greenish yellow

Na₂S₂O₄, alkaline — reddish violet; acid — yellowish red

64500 C.I. Disperse Blue 1 (Blue)

C.I. Solvent Blue 18 (Blue)



(a) Acylate 1,5-diaminoanthraquinone with oxalic acid, nitrate in sulfuric acid, hydrolyse and reduce

(b) Reduce mixed 1,5- and 1,8-dinitroanthraquinone to the corresponding diamino compounds, acetylate, re-nitrate, reduce and hydrolyse

(c) As (b) above except that the second nitration is carried out in the presence of boric and sulfuric acids

Brit. Celanese., BP 647325

BIOS 1484, 53; FIAT 1313, 2, 207

FIAT 764 — Cellitonblau ex.

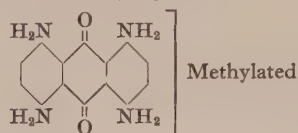
Fierz-David & Blangely, Table 16

Thorpe, 1, 41

Soluble in acetone, alcohol, Cellosolve

Slightly soluble in benzene, linseed oil

H₂SO₄ conc. — brown; on dilution — claret

64505 C.I. Disperse Blue 31 (Bright blue)

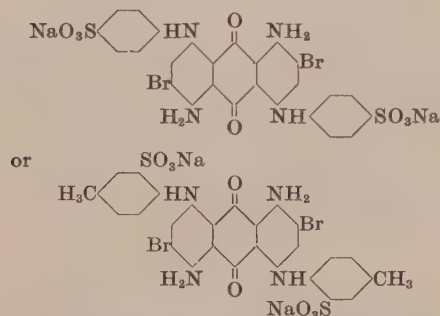
Methylate **C.I.64500** with methanol in sulfuric acid

Discoverer — I.G. 1932

I.G., *GP* 602690 (*Fr.* 20, 1345)

BIOS 1484, 53; *FIAT* 1313, 2, 208

FIAT 764 — Cellitonblau 3G

64510 C.I. Acid Blue 81 (Dull greenish blue)

Brominate 1,5-diaminoanthraquinone to 1,5-diamino-2,4,6,8-tetra-bromoanthraquinone. Condense with *p*-toluidine, sulfonate, and convert to the sodium salt

Note — Aniline and *m*-toluidine give similar products

Discoverer — O. Bally 1898

Badische Co., *BP* 8051/99; *USP* 632621, 749913; *FP* 292271;

GP 121528, 121684, 137783, (*Fr.* 6, 391, 395, 395)

FIAT 1313, 2, 234

FIAT 764 — Alizarinreinblau NA

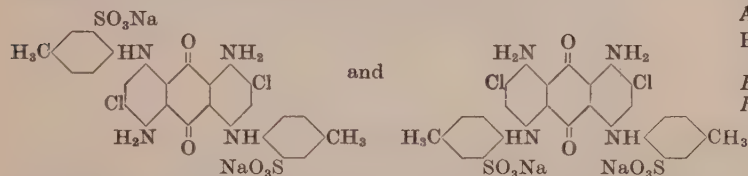
Scholl & Berblinger, *Ber.* 37 (1904), 4183

Barnett, 198

Fierz-David, 518

Houben, 477

Fierz-David & Blangey, Table 16

64515 C.I. Acid Blue 81 (Dull greenish blue)

Dinitrate anthraquinone to give a mixture of 1,5- and 1,8-dinitro-anthraquinone, reduce and chlorinate to the tetrachloro-derivative, condense with *p*-toluidine, sulfonate and convert to the sodium salt

Discoverer — Badische Co. 1899

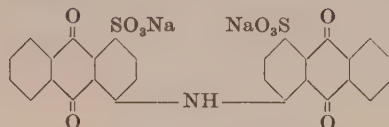
Anthraquinone Blue SR (IG)

Badische Co., *BP* 8051/99; *USP* 640985; *FP* 292271; *GP* 121685

(*Fr.* 6, 396)

BIOS 1484, 50; *FIAT* 1313, 2, 220

FIAT 764 — Anthrachinonblau SR

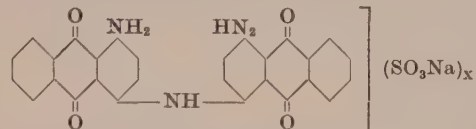
65000 C.I. Acid Brown 26 (Brown)

Condense 1-aminoanthraquinone with 1-chloroanthraquinone, sulfonate with oleum and convert to the sodium salt

Discoverer — W. Mieg 1922

I.G., *GP* 436539 (*Fr.* 15, 679)

FIAT 764 — Alizarinlichtbraun GL

65005 C.I. Acid Black 48 (Bluish grey → Greenish navy)

(a) Condense 1,4-diaminoanthraquinone with 1-amino-4-bromo-anthraquinone in the presence of copper and sodium acetate, sulfonate with oleum with or without boric acid and convert to the sodium salt

(b) Nitrate 1,1'-dianthrimide. Reduce, sulfonate and convert to the sodium salt

Discoverers — H. Raeder and W. Mieg 1922

Bayer Co., *BP* 201575; *USP* 1508409; *FP* 567767; *SwissP*

105715, 106423, 106424; *GP* 414865 (*Fr.* 15, 681)

BIOS 1484, 37; *FIAT* 1313, 2, 216

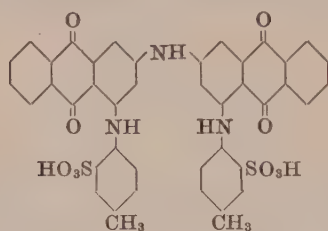
FIAT 764 — Alizarinlichtgrau BBL, BBLW

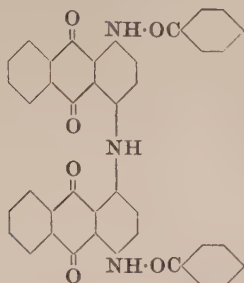
Soluble in ethanol

Slightly soluble in Cellosolve

Insoluble in acetone, benzene, carbon tetrachloride, Stoddard solvent

H_2SO_4 conc. — grey; on dilution — grey ppt.

65008 C.I. Acid Black 97 (Greenish grey)

65010 C.I. Vat Black 28 (Grey)

Nitrate 1,1'-dianthrimide, reduce with sodium sulfide and benzoylate

Discoverer — W. Mieg 1908

Bayer Co., BP 5382/09, 25986/09; USP 970278, 971224, FP 400653, 405760; GP 213501 (Fr. 9, 781), 220581, 225232, (Fr. 9, 764, 1197), 227104, 228992, 239544, (Fr. 10, 643, 644, 638)

FIAT 764 — Indanthrengrau K

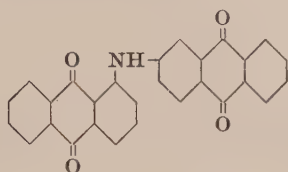
Werner, *Färberztg.* (1910), 390

Thorpe, 1, 420

Slightly soluble in xylene

H₂SO₄ conc. — yellowish green; on dilution — grey ppt.

Na₂S₂O₄, alkaline — reddish brown; acid — yellowish brown

65015 Vat Dye (Reddish orange)

(a) Condense 1-aminoanthraquinone with 2-chloroanthraquinone in presence of cupric chloride and sodium acetate

(b) Condense 1-nitroanthraquinone or 1-anthraquinonesulfonic acid with 2-aminoanthraquinone

Discoverer — M. H. Isler 1905

Algol Orange R (By)

Application method A/Q3

Fastness Properties (C): Chlorine 5, Light 7, Soda boil 3-4

Bayer Co., BP 24810/08; USP 814137; FP 396451; GP 174699 (Fr. 8, 365), 208845 (Fr. 9, 847)

M.L.B., GP 201327, 216083, (Fr. 9, 774, 775)

Vlies, *JSDC*, 30 (1914), 28

Fraser-Thomson, *JSDC*, 52 (1936), 242

Barnett, 235

Fierz-David, 580

Houben, 466

Fierz-David & Blangey, Table 17

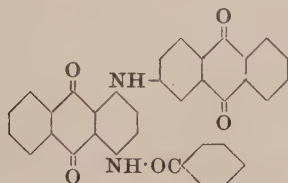
Thorpe, 1, 420

Soluble in tetrahydronaphthalene

Slightly soluble in xylene

H₂SO₄ conc. — bluish green; on dilution — orange red ppt.

Na₂S₂O₄, alkaline — orange; acid — yellow

65020 C.I. Vat Violet 16 (Dull violet)

Condense 1-amino-4-benzamidoanthraquinone with 2-chloroanthraquinone in naphthalene in the presence of copper powder and sodium acetate

Discoverers — P. Thomaschewski, P. Fischer, and H. Raeder 1906

Bayer Co., BP 25986/09; USP 970278, 971224, 971225, 986521; FP 409407; GP 220581 (Fr. 9, 764), 228992 (Fr. 10, 644)

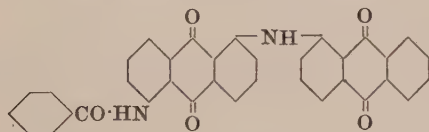
BIO S 1493, 14

FIAT 764 — Indanthrenkorinth RK

Soluble in pyridine, tetrahydronaphthalene, xylene

H₂SO₄ conc. — greenish brown; on dilution — reddish violet ppt.

Na₂S₂O₄, alkaline — bordeaux; acid — greenish brown

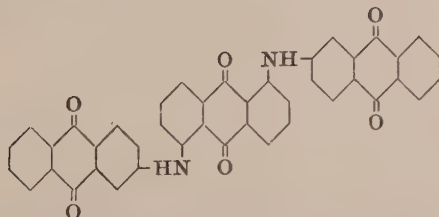
65025 C.I. Vat Orange 20 (Yellowish orange)

Condense 1-benzamido-5-chloroanthraquinone with 1-aminoanthraquinone

Thorpe, 1, 226

Insoluble in alcohol

Na₂S₂O₄, alkaline — reddish brown; acid — yellow

65200 Vat Dye

Condense 1,5-diaminoanthraquinone with 2 mol. 2-chloroanthraquinone in presence of copper chloride

Discoverers — M. H. Isler and F. Kačer 1906

Antra Bordeaux RT (B) (also named Indanthren Bordeaux B (B))

Application method A/Q2

Fastness Properties: Chlorine, good; Light, very good (C.I.1146 (1st Edn.) — unconfirmed)

Badische Co., BP 10324/06; USP 863397; FP 365920; GP 162824, 184905, (Fr. 8, 363, 367)

Vlies, *JSDC*, 30 (1914), 28

Fraser-Thomson, *JSDC*, 52 (1936), 242

Truttwin, 240

Barnett, 190, 235

Fierz-David, 581

Houben, 468

Thorpe, 1, 420

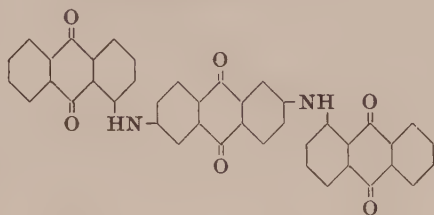
Slightly soluble in alcohol (hot)

Insoluble in xylene

H₂SO₄ conc. — bluish green; on dilution — bordeaux ppt.

Na₂S₂O₄, alkaline — dull yellowish red

65205 C.I. Vat Red 48 (Dull yellowish red)

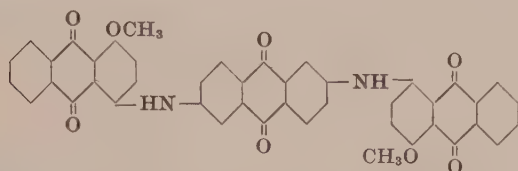


Condense 2,6-dichloroanthraquinone with 2 mol. 1-aminoanthraquinone in presence of cuprous chloride and sodium acetate in nitrobenzene solution

Discoverers — M. H. Isler and F. Kačer 1907
Badische Co., BP 4235/07; USP 863397; FP 365920; GP 197554 (Fr. 9, 765)
BIOS 1493, 33
Vlies, JSDC, 30 (1914), 28
Fraser-Thomson, JSDC, 52 (1936), 242
Barnett, 235
Fierz-David, 581
Houben, 468

Slightly soluble in xylene
Insoluble in alcohol
H₂SO₄ conc. — bluish green; on dilution — scarlet ppt.
Na₂S₂O₄, alkaline — reddish brown; acid — olive brown

65210 Vat Dye (Dull red)



Condense 2,6-dichloroanthraquinone with 2 mol. 1-amino-4-methoxyanthraquinone in presence of cuprous chloride

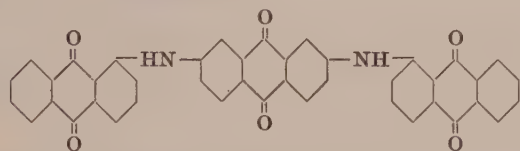
Discoverer — Bayer Co. 1909

Algol Bordeaux 3B (By)

Application method A/Q3
Fastness Properties: Chlorine, good; Light, good (C.I.1141 (1st Edn.) — unconfirmed)
Bayer Co., BP 9219/09; FP 403259; GP 216668 (Fr. 9, 763)
Fierz-David, 581
Houben, 468
Thorpe, 1, 420

Soluble in tetrahydronaphthalene, xylene
H₂SO₄ conc. — bluish green; on dilution — red ppt.
Na₂S₂O₄, alkaline — brownish red; acid — dull yellow

65215 Vat Dye (Dull red)



Condense 2,7-dichloroanthraquinone with 2 mol. 1-aminoanthraquinone in presence of cuprous chloride

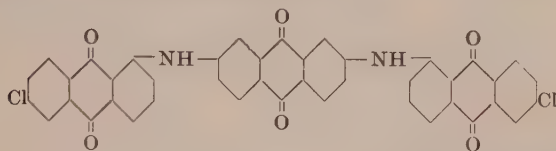
Discoverers — M. H. Isler and F. Kačer 1907

Anthra Red RT (B)

Application method A/Q2
Fastness Properties (C): Chlorine 4-5, Light 4-5, Soda boil 4
Badische Co., BP 4235/07; USP 863397; FP 365920; GP 197554 (Fr. 9, 765)
Vlies, JSDC, 30 (1914), 28
Fierz-David, 581
Houben, 468
Thorpe, 1, 420

Insoluble in alcohol
H₂SO₄ conc. — dark green; on dilution — dull bluish red ppt.
Na₂S₂O₄, alkaline — yellowish red; acid — yellow

65220 Vat Dye (Dull bluish red)



Condense 2,7-dichloroanthraquinone with 2 mol. 1-amino-6-chloroanthraquinone in presence of copper oxide

Note — An isomeric compound may be obtained from 2,6-dichloroanthraquinone

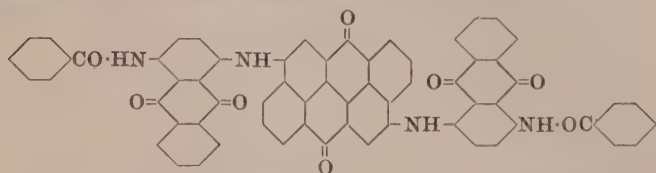
Discoverers — M. H. Isler and H. Wolff 1908

Anthra Bordeaux R (B)

Application method A/Q2
Fastness Properties (C): Chlorine 4, Light 4, Soda boil 3-4
Badische Co., BP 7418/08; USP 961612; FP 365920; GP 206717 (Fr. 9, 767)
Fierz-David, 580
Houben, 468
Thorpe, 1, 420

Soluble in tetrahydronaphthalene, xylene
Slightly soluble in alcohol
H₂SO₄ conc. — greenish blue; on dilution — crimson ppt.
Na₂S₂O₄, alkaline — dull yellowish red; acid — greenish brown

65225 C.I. Vat Black 29 (Bluish grey → Navy)



Condense 4,10-dibromoanthanthrone with 2 mol. 1-amino-4-benzamidoanthraquinone

Discoverer — R. Heidenreich 1927

I.G., BP 286669; USP 1880440; FP 650501; GP 485961 (Fr. 16, 1422)
BIOS 1493, 23
FIAT 764 — Indanthrengrau BG
Kunz, Text-Rund. 6 (1951), 542; Melliand. 33 (1952), 65

Na₂S₂O₄, alkaline — bordeaux; acid — yellowish brown

65230 C.I. Vat Black 9 (Black)

A complex imide of pyranthrone, aminoanthraquinone and amino-violanthrone

Condense tetrabromopyranthrone in nitrobenzene with amino-violanthrone and 1-aminoanthraquinone in presence of copper oxide and sodium acetate

Discoverer — I.G. 1928

I.G., *BP* 318180

BIOS 987, 4, 63; *FIAT* 1313, 2, 118

FIAT 764 — Indanthrendirektschwarz RB

Fox, *JSDC*, 65 (1949), 518

Kunz, *Text-Rund.* 6 (1951), 542; *Melliand.* 33 (1952), 65

H₂SO₄ conc. — violet; on dilution — black

Na₂S₂O₄, alkaline — dull blue; acid — reddish brown

65250 C.I. Vat Brown 23 (Dull brown)

Treat 2-aminoanthraquinone with sulfuric acid and copper powder

Discoverer — M. H. Isler 1907

Badische Co., *BP* 16505/07; *USP* 876190; *FP* 379414;

GP 190656 (*Fr.* 9, 786)

Truttwin, 538

Fierz-David, 619

Houben, 785

Soluble in tetrahydronaphthalene, xylene

H₂SO₄ conc. — dull brown; on dilution — dull brown ppt.

Na₂S₂O₄, alkaline — grey; acid — dull violet

65255 Vat Dye

Treat a solution of 1-methylaminoanthraquinone in sulfuric acid with aluminium bronze

Discoverer — J. Deinet 1906

Leucol Dark Green B (By)

Only moderate all-round fastness

Bayer Co., *BP* 25507/07; *USP* 874744; *FP* 380176; *GP* 205422

(*Fr.* 9, 805)

Soluble in pyridine

H₂SO₄ conc. — greyish violet; on dilution — olive brown ppt.

Na₂S₂O₄, alkaline — dull reddish violet

65260 C.I. Vat Black 23 (Grey)

Fuse 1,5(or 1,8)-diaminoanthraquinone with potassium hydroxide

Discoverer — R. Bohn 1904

Badische Co., *BP* 712/04; *USP* 767259; *FP* 341126; *GP* 157685

(*Fr.* 8, 353)

Slightly soluble in tetrahydronaphthalene, xylene

Insoluble in alcohol

H₂SO₄ conc. — brown; on dilution — blackish brown ppt.

Na₂S₂O₄, alkaline — dull reddish violet

65265 Vat Dye

Treat 1,5-diaminoanthraquinone with formaldehyde and react the product with potassium hydroxide

Discoverer — R. Bohn 1904

Indanthren Maroon R (B)

Fastness Properties: Light, good (*C.I.1125 (1st Edn.)* — unconfirmed)

Badische Co., *BP* 712/04; *USP* 791869; *FP* 341126; *GP* 123745

(*Fr.* 6, 309), 160814 (*Fr.* 8, 353)

Slightly soluble in alcohol (hot)

H₂SO₄ conc. — dull brown; on dilution — dull violet ppt.

Na₂S₂O₄, alkaline — dull red

65270 Vat Dye

Heat 1-amino-2-methylantraquinone with sulfur at approx. 280°C

Discoverers — A. Schaarschmidt and B. Mayer 1908

Cibanone Brown B (Ciba)

Fastness Properties: Chlorine, poor; Light, moderate; Washing, moderate (*C.I.1171 (1st Edn.)* — unconfirmed)

Ciba, *BP* 13057/08; *USP* 915385; *FP* 398015; *SwissP* 41000;

GP 204958, 209231, 209232, 209233, 213506, (*Fr.* 9, 807, 810,

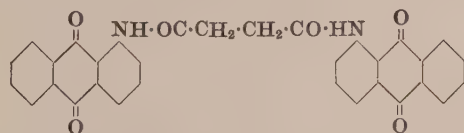
814, 815, 813), 223176 (*Fr.* 10, 747)

Schaarschmidt & Lewyeff, *J. prakt. Chem.* 113 (1926) (2), 48

Houben, 786

H₂SO₄ conc. — reddish brown; on dilution — brown ppt.

Na₂S₂O₄, alkaline — yellowish brown

65400 Vat Dye (Greenish yellow)

Condense 1-aminoanthraquinone with succinic acid with or without nitrobenzene

Discoverer — P. Fischer 1908

Algol Yellow 3GK (FBY)

Application method A/Q3

Fastness Properties (C): Chlorine 5, Light 5-6, Soda boil 5

Bayer Co., *BP* 27098/08, 3055/09; *USP* 938566, 964816;

FP 399495, 404190; *GP* 210019, 212436, (*Fr.* 9, 750, 751),

223510, 226940, (*Fr.* 10, 641, 649)

Vlies, *JSDC*, 30 (1914), 29

Barnett, 191, 214

Fierz-David, 573

Houben, 459

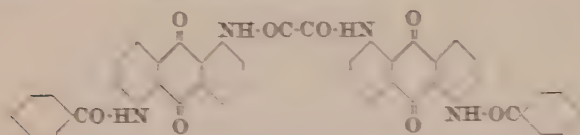
Thorpe, 1, 417

Soluble in xylene

H₂SO₄ conc. — yellow; on dilution — yellow flocculent ppt.

Na₂S₂O₄, alkaline — yellowish red; acid — greenish yellow

65405 C.I. Vat Yellow 12 (Yellow)



Condense 1-amino-5-benzamidoanthraquinone with oxalyl chloride in nitrobenzene

Note — Commercial products often contain some 1.8-isomer

Discoverer — M. Kugel 1924

Bayer Co., *BP* 231532; *USP* 1651461; *FP* 595628; *GP* 448286 (*Fr.* 15, 685)

BIOS 987, 183; *BIOS* 1493, 56

FIAT 764 — Indanthrengeilb 3GF

Hefti, *Helv. Chim. Acta*, **14** (1931), 1413

Schulz, *Suppl.* 2, 66

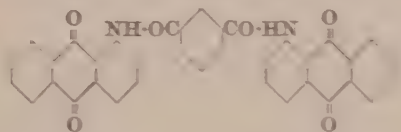
Fierz-David, *Suppl.* 81

Fierz-David & Bluney, Table 16

H_2SO_4 conc. — reddish brown; on dilution — orange ppt.

$\text{Na}_2\text{S}_2\text{O}_4$, alkaline — dull green; acid — dull yellowish brown

65410 C.I. Vat Yellow 26 (Greenish yellow)



Acylate 1-aminoanthraquinone with isophthaloyl chloride

Discoverers — K. H. Meyer, H. Hopff, and A. Krause 1925

Badische Co., *BP* 264561; *USP* 1748240; *FP* 604347; *GP* 469019 (*Fr.* 16, 1338)

BIOS 987, 185; *BIOS* 1157, 18; *BIOS* 1493, 77

FIAT 764 — Indanthrengeilb 5GK

Hefti, *Helv. Chim. Acta*, **14** (1931), 1415

Fierz-David, *Suppl.* 80

Soluble in *o*-chlorophenol, nitrobenzene, tetrahydronaphthalene, xylene

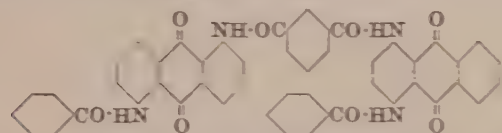
Slightly soluble in acetone, benzene, chloroform (hot), pyridine, toluene (hot)

Insoluble in alcohol

H_2SO_4 conc. — yellow; on dilution — yellow ppt.

$\text{Na}_2\text{S}_2\text{O}_4$, alkaline — bordeaux; acid — yellowish brown

65415 C.I. Vat Orange 17 (Orange)



Condense isophthaloyl chloride with 1-amino-4-benzamidoanthraquinone and 1-amino-5-benzamidoanthraquinone

Discoverers — W. Mieg and F. Wieners 1935

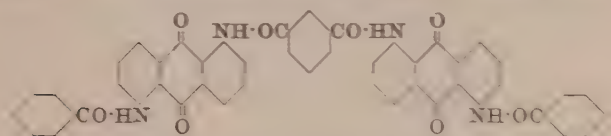
I.G., *BP* 476255; *USP* 2123375; *FP* 807939; *GP* 653386 (*Fr.* 24, 862)

FIAT 764 — Indanthrenorange GG

Fox, *JSDC*, **65** (1949), 510

$\text{Na}_2\text{S}_2\text{O}_4$, alkaline — bordeaux; acid — dull orange

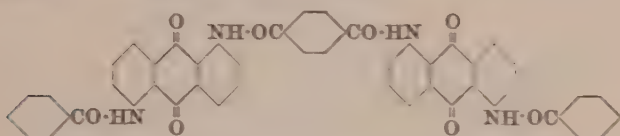
65420 C.I. Vat Yellow 23 (Bright yellow → Reddish yellow)



Wegmann, *Text.-Rund.* **8** (1953), 102

$\text{Na}_2\text{S}_2\text{O}_4$, alkaline — bordeaux; acid — reddish brown

65425 C.I. Vat Yellow 13 (Yellow)



Condense 1-amino-5-benzamidoanthraquinone with terephthaloyl chloride

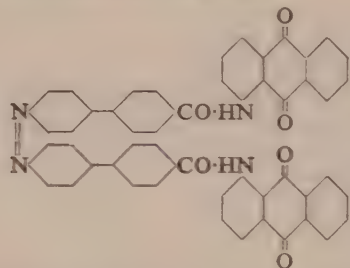
Discoverer — I.C.I. 1943

Turner, *JSDC*, **63** (1947), 377

H_2SO_4 conc. — dull reddish brown

$\text{Na}_2\text{S}_2\text{O}_4$, alkaline — dull green; acid — yellowish orange

65429 C.I. Vat Yellow 33 (Bright yellow)



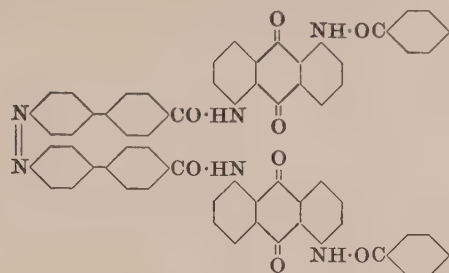
Reduce 4'-nitro-4-biphenylcarboxylic acid with glucose and sodium carbonate. Treat the azo compound so formed with thionyl chloride and condense with 1-aminoanthraquinone

Discoverer E. Honold and M. Schubert. 1937

Literature IG. *GP* 717352

Reactions H_2SO_4 conc. — Brownish Red

$\text{Na}_2\text{S}_2\text{O}_4$ acid — Yellow, alkaline — Bordeaux

65430 C.I. Vat Yellow 10 (Bright reddish yellow)

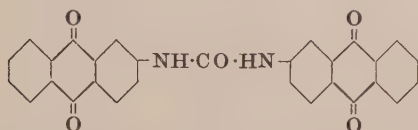
Reduce 4'-nitro-4-biphenylcarboxylic acid with glucose and caustic soda. Treat the azo compound so formed with thionyl chloride and condense with 1-amino-5-benzamidoanthraquinone

Discoverer — I.G.

BIOS 987, 132; FIAT 1313, 2, 178

FIAT 764 — Indanthrengeblb GGF

Na₂S₂O₄, alkaline — bordeaux; acid — yellowish brown

65435 Vat Dye (Greenish yellow → Yellow)

- (a) Treat 2-aminoanthraquinone with phosgene and condense the resultant 2-anthraquinonylcarbamyl chloride with 2-aminoanthraquinone
(b) Condense 2-aminoanthraquinone with urea

Soluble in tetrahydronaphthalene, xylene
H₂SO₄ conc. — yellowish red; on dilution — yellow ppt.
Na₂S₂O₄, alkaline — reddish orange; acid — bright yellow

Discoverers — A. Schmidt and G. Kränzlein 1909

Helindon Yellow 3GN (MLB)

Application method A/Q3

Fastness Properties (C): Chlorine 5, Light 4–5, Soda boil 5
M.L.B., BP 24920/09, 12129/10; USP 958325; FP 410842;
GP 224490, 231835, 232276, 232739, 236375, 236981, 238551,
238552, 238553, 242292, (Fr. 10, 658, 661, 677, 659, 662,
667, 671, 671, 672, 674)

Agfa, BP 8917/14; FP 470562; GP 281010 (Fr. 12, 448)

Gebhard, *J. prakt. Chem.* **84** (1911) (2), 625

Ullmann & Medenwald, *Ber.* **46** (1913), 1798

Vlies, *JSDC*, **30** (1914), 29

Barnett, 220, 221

Fierz-David, 578

Houben, 459

65600 Vat Dye

Treat 2-aminoanthraquinone with phosgene and condense the 2-anthraquinonylcarbamyl chloride in nitrobenzene suspension in presence of sodium acetate

Discoverer — A. Schmidt and G. Kränzlein 1909

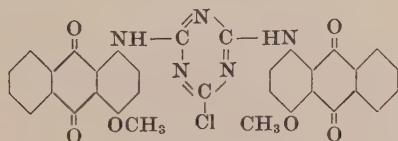
Helindon Orange GRN (MLB)

Application method A/Q3

Fastness Properties: Chlorine, good–very good; Light, good–very good (Schultz (7th Edn.) 1251 — unconfirmed)
M.L.B., BP 11804/10, 15523/10; USP 1038003, 1025195;
FP 415789, 417113; GP 232135, 241822, (Fr. 10, 676, 656)
Barnett, 221

H₂SO₄ conc. — green; on dilution — yellowish red ppt.

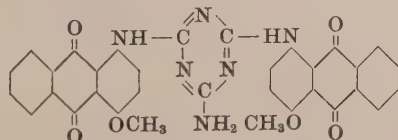
Na₂S₂O₄, alkaline — brown; acid — yellow

65705 C.I. Vat Orange 18 (Bright reddish orange)

Condense cyanuric chloride with 2 mol. 1-amino-4-methoxyanthraquinone

Discoverer — Ciba 1921

Ciba, GP 390201, 399485, (Fr. 14, 878, 880)

65710 C.I. Vat Red 28 (Yellowish red)

Condense 2-amino-4,6-dichloro-1,3,5-triazine with 2 mol. 1-amino-4-methoxyanthraquinone

Discoverer — Ciba

Ciba, *SwissP* 100397

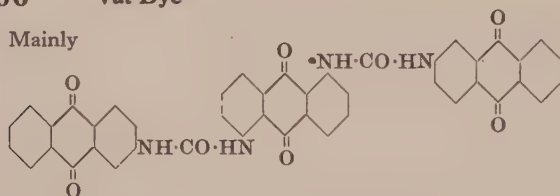
Fierz-David & Matter, *JSDC*, **53** (1937), 434

H₂SO₄ conc. — yellowish red; on dilution — orange ppt.

Na₂S₂O₄, alkaline — reddish orange; acid — yellow

66000 Vat Dye

Mainly



Condense 2 mol. 2-anthraquinonylcarbonyl chloride with 1,5-diaminoanthraquinone

Note — The dye contains a small amount of the 1,8,2',2''-isomer

Discoverers — A. Schmidt and G. Kränzlein 1909

Helindon Brown 3GN (MLB)

Fastness Properties: Chlorine, good; Light, good (*C.I.1148* (1st Edn.) — unconfirmed)
Schmidt & Kränzlein, *USP* 958325
M.L.B., *GP* 236375 (*Fr.* 10, 662)
Barnett, 221
Fierz-David, 578
Houben, 459

Slightly soluble in tetrahydronaphthalene, xylene
 H_2SO_4 conc. — brown; on dilution — yellowish brown ppt.
 $Na_2S_2O_4$, alkaline — dull orange; acid — yellow

66050 Vat Dye

Treat a mixture of 1-acetamidoanthraquinone and 1,6(or 1,7)-diacetamidoanthraquinone with phosphorus oxychloride

Soluble in alcohol

H_2SO_4 conc. — orange brown; on dilution — brownish yellow ppt.

$Na_2S_2O_4$, alkaline — reddish brown

Discoverer — F. Kačer 1907

Indanthren Copper R (B)

Fastness Properties: Chlorine, good; Light, good (*C.I.1156* (1st Edn.) — unconfirmed)
Badische Co., *BP* 9657/07; *USP* 925917; *FP* 370070; *GP* 192970, 198048, (*Fr.* 9, 788, 789), 274930 (*Fr.* 12, 503)
Fierz-David, 619

66055 Vat Dye

Treat a mixture of 2-acetamidoanthraquinone and 1,6(or 1,7)-diacetamidoanthraquinone with phosphorus oxychloride

Slightly soluble in alcohol (hot)

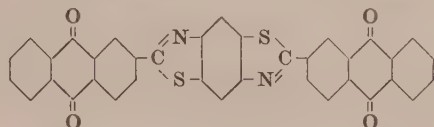
H_2SO_4 conc. — dark brown; on dilution — yellowish brown ppt.

$Na_2S_2O_4$, alkaline — dull orange; acid — dull greenish yellow

Discoverer — F. Kačer 1907

Indanthren Orange RT (B)

Application method A/Q1
Fastness Properties: Chlorine, good; Light, good (*C.I.1157* (1st Edn.) — unconfirmed)
Badische Co., *BP* 9657/07; *USP* 925917; *FP* 370070; *GP* 192970, 198048, (*Fr.* 9, 788, 789), 274930 (*Fr.* 12, 503)
Vlies, *JSDC*, 30 (1914), 29
Fierz-David, 619

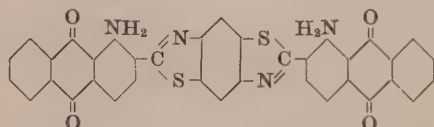
66500 C.I. Vat Yellow 18 (Bright reddish yellow)

Fuse 2-methylantraquinone with *p*-phenylenediamine and sulfur

Discoverer — Cassella Co. 1921

Cassella Co., *BP* 189367; *USP* 1440833; *FP* 545367; *GP* 382923 (*Fr.* 14, 887)
BIOS 987, 125; *BIOS* 1493, 3
FIAT 764 — Algoldgelb GR

$Na_2S_2O_4$, alkaline — brownish olive; acid — reddish brown

66505 Vat Dye

Heat together 1-amino-2-methylantraquinone, *p*-phenylenediamine and sulfur

Discoverers — G. Kalischer and D. Missen 1913

Hydron Violet N (C)

Cassella Co., *BP* 1443/14; *USP* 1129574, 1129575; *FP* 475010; *GP* 283725 (*Fr.* 12, 463)
FIAT 764, *FDX* 885 (*PB* 74762) — Hydronviolett N

66510 C.I. Vat Yellow 9 (Reddish yellow → Yellowish orange)

(a) Heat 2-methylantraquinone with benzidine and sulfur at 250°C

(b) Thionate the azomethine derived from 2-anthraquinone-carboxaldehyde and benzidine

Discoverer — Cassella Co. 1915

Cassella Co., *SwissP* 99286; *GP* 376815, 379615, (*Fr.* 14, 865, 887)
I.G., *GP* 433086 (*Fr.* 16, 1359), 529649 (*Fr.* 18, 1325)
BIOS 987, 125; *BIOS* 1493, 55
FIAT 764 — Indanthrengelb GF
Weinberg, *Ber.* 63A (1930), 117, 118
Fierz-David, *JSDC*, 51 (1935), 54, 62
Mayer, 133
Fierz-David, Suppl. 87
Schultz, Suppl. 1, 46; 2, 76

Insoluble in alcohol, organic solvents
 H_2SO_4 conc. — dull yellow; on dilution — yellow ppt.
 $Na_2S_2O_4$, alkaline — olive; acid — yellowish brown

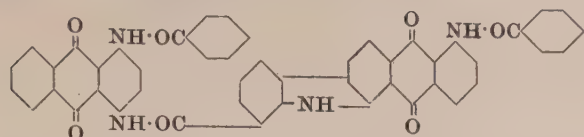
66515 Vat Dye

Heat together 1-amino-2-methylantraquinone, benzidine and sulfur

Discoverers — G. Kalischer and D. Missen 1913

Hydron Bordeaux B (C)

Cassella Co., *BP* 1443/14; *USP* 1129574, 1129575; *FP* 475010; *GP* 283725, 287005, (*Fr.* 12, 463, 463)
FDX 885 (*PB* 74762) — Hydronbordo B

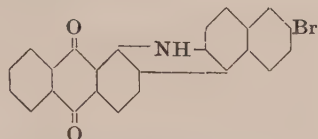
66700 **Vat Dye**

Discoverer — I.G.

Indanthren Orange RRN (IG)

FIAT 1313, 3, 88

Acylate 1-amino-4-benzamidoanthraquinone with *o*-chlorobenzoyl chloride and then condense with 1-amino-5-benzamidoanthraquinone. Cyclise to the carbazole

66705 **Vat Dye**

Discoverer — I.G.

Condense 1-aminoanthraquinone with 2-chloronaphthalene. Brominate and cyclise. (The bromine enters the naphthalene nucleus in positions 1 and 6)

Note — Parent compound for the preparation of **C.I.66706**

66706 **Solubilised Vat Dye**

Leuco sulfuric ester of **C.I.66705**

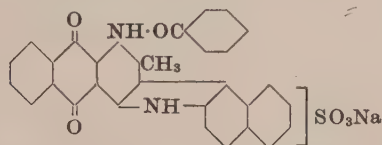
Prepare by general methods — see **C.I.59051A**

Discoverers and references —

General — see **C.I.59051A**

Additional —

FDX 885 (PB 82175) — Anthrasolorange IGG, I4G

Anthrasol Orange IGG, I4G (IG)**66710** **C.I. Acid Brown 27 (Brown)**

Acylate 1-amino-2-methyl-4-(2-naphthylamino)anthraquinone with benzoyl chloride and sulfonate

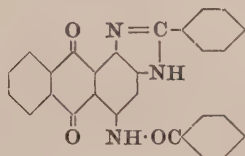
Discoverer — E. Gutzwiller 1932

Sandoz, BP 408440; USP 2093355; FP 752280; SwissP 160757;

GP 593867 (Fr. 20, 1347)

Buxtorf & Peter, Text-Rund. 8 (1953), 3

H₂SO₄ conc. — Bluish violet; on dilution — dull orange ppt.

66795 **Vat Dye (Orange)**

(a) Condense 1,2,4-triaminoanthraquinone with benzoyl chloride

(b) Condense 1,2,4-triaminoanthraquinone with benzaldehyde and benzoylate

Discoverer — J. Deinet 1909

Algol Brilliant Orange FR (By)

Application method A/Q3

Fastness Properties: Chlorine, good; Light, very good (C.I.1136 (1st Edn.) — unconfirmed)

Bayer Co., BP 2702/09; USP 957040, 1022781; FP 400653; GP 225232 (Fr. 9, 1197), 238981, 238982, 247246, (Fr. 10, 757, 759, 760)

Vlies, JSDC, 30 (1914), 29

Barnett, 218

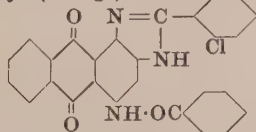
Fierz-David, 574

Houben, 458, 460

Soluble in pyridine, xylene

H₂SO₄ conc. — yellowish red; on dilution — orange red flocculent ppt.

Na₂S₂O₄, alkaline — reddish orange; acid — yellow

66800 **Vat Dye (Orange)**

Condense 1,2,4-triaminoanthraquinone with *o*-chlorobenzaldehyde and benzoylate

Discoverer — I.G.

Indanthren Orange RRK (IG)

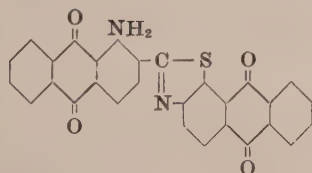
Application method A/Q3

Fastness Properties (C): Chlorine 5, Light 6-7, Soda boil 3-4

Bayer Co., USP 1023248; FP 432279; SwissP 56850; GP 225232 (Fr. 9, 1197), 238981, 238982, 247246, (Fr. 10, 757, 759, 760)

FDX 885 (PB 74778) — Indanthrenorange RRK

Kunz, Text-Rund. 6 (1951), 544; Melland. 33 (1952), 66

66805 **Vat Dye**

Condense 1-amino-2-anthraquinonecarboxaldehyde with 2-amino-1-mercaptoanthraquinone and treat with sodium hypochlorite

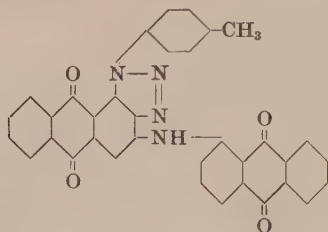
Discoverer — G. Kalischer 1919

Indanthren Bordeaux R (MLB)

Cassella Co., GP 366272 (Fr. 14, 863)

FDX 885 (PB 74778) — Indanthrenbordo R

66810 Vat Dye



React 3-bromo-1'-p-tolyl-1,2-triazoloanthraquinone with 1-aminoanthraquinone

Discoverer — H. Friedmann 1912

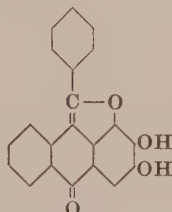
Alcol Red G (By)

Bayer Co., BP 17829/12; USP 1065440; FP 453313; GP 254745

(Fr. 11, 648)

FDX 885 (PB 82170) — Alcolrot G

66900 Mordant Dye



Condense benzoin with gallic acid in presence of cold sulfuric acid

Discoverer — R. Bohn 1897

Benzoin Yellow (B)

Yellow on chromium-mordanted wool, fast to milling but not fast to light (C.I.1090 (1st Edn.) — unconfirmed)

Badische Co., BP 14919/97; USP 623069; FP 268637; GP 95739

(Fr. 5, 328)

Graebe, Ber. 31 (1898), 2975

Georgievics, 265

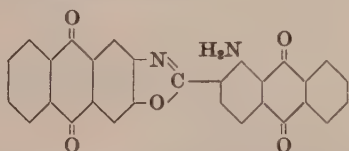
Houben, 613

Soluble in alcohol

Insoluble in water

H₂SO₄ conc. — yellow (strong green fluorescence)

67000 C.I. Vat Red 10 (Bluish red)



Condense 1-nitro-2-anthraquinonecarbonyl chloride with 2-amino-3-hydroxyanthraquinone and ring close to the oxazole. Reduce the nitro group

Discoverers — M. A. Kunz, G. von Rosenberg, and E. Goffarjé 1926

I.G., BP 298545; GP 475687 (Fr. 16, 1341)

BIOS 960, 4; BIOS 987, 2, 13, 161; FIAT 1313, 2, 152

FIAT 764 — Indanthrenrot FBB

Venkataraman, 912

H₂SO₄ conc. — dull yellow; on dilution — red

Na₂S₂O₄, alkaline — dull brown; acid — yellowish brown

67001 C.I. Solubilised Vat Red 10 (Bluish red)

Leuco sulfuric ester of C.I.67000

Prepare by general methods — see C.I.59051A

Discoverers and references —

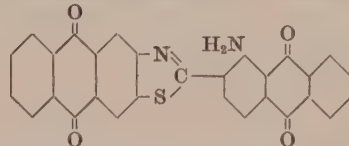
General — see C.I.59051A

Additional —

BIOS 960, 24

FIAT 764 — Anthrasolrot IFBB

67100 C.I. Vat Red 20 (Bluish red → Reddish violet)



Condense 2-amino-3-chloroanthraquinone with 1-nitro-2-anthraquinonecarboxylic acid, reduce, convert to the mercapto derivative and cyclise

Discoverer — I.G. 1934

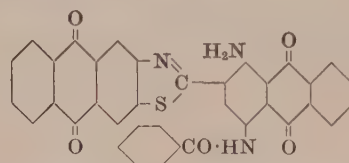
I.G., BP 436951; GP 623028 (Fr. 22, 1081)

BIOS 987, 2, 16, 158

FIAT 764 — Indanthrenrubin B

Na₂S₂O₄, alkaline — brownish olive; acid — orange

67105 C.I. Vat Blue 31 (Dull blue)



Condense 1-amino-4-nitro-2-anthraquinonecarboxylic acid with 2-amino-3-chloroanthraquinone. Form the mercaptan, cyclise, reduce, and benzoylate

Discoverers — E. Berthold and J. Müller 1934

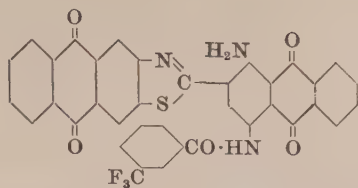
I.G., BP 436951; GP 623028 (Fr. 22, 1081)

BIOS 987, 3, 17; FIAT 1313, 2, 65, 72

FIAT 764 — Indanthrenblau CLG

Venkataraman, 915

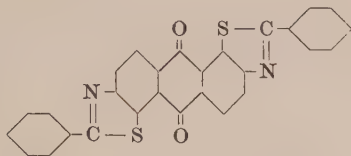
Na₂S₂O₄, alkaline — dull violet; acid — reddish brown

67110 C.I. Vat Blue 30 (Blue)

Prepare as **C.I.67105** using *m*-trifluoromethylbenzoyl fluoride for final acylation

Discoverers — H. Schlichenmaier, L. Berlin, and E. Berthold 1938
I.G., *BP* 436951, 515580; *USP* 2244655; *GP* 692750 (*Fr.-Bayer*, 1-2, 330)
BIOS 987, 3, 17, 152, 157; *BIOS-MISC* 20, App. 42
BIOS-MISC 55, 13
FIAT 1114, 46; *FIAT* 1313, 2, 65, 72
Venkataraman, 915

$\text{Na}_2\text{S}_2\text{O}_4$, alkaline — violet; acid — reddish brown

67300 C.I. Vat Yellow 2 (Greenish yellow)

(a) Reflux 2,6-diaminoanthraquinone, benzotrichloride and sulfur in naphthalene

(b) Condense 2,6-diamino-1,5-dimercaptoanthraquinone with benzaldehyde

(c) Condense 2,6-diamino-1,5-dichloroanthraquinone with benzaldehyde and sulfur

(d) Convert 2,6-dibenzamidoanthraquinone to the iminochloride 2,6-bis(α -chlorobenzylideneamino)anthraquinone), then sulfurise with sulfur and naphthalene or with aqueous sodium sulfhydrylate

Note — Some products contain the 1,2,7,8 isomer

Discoverers — M. H. Isler and F. Kačer 1912

Badische Co., *BP* 1970/12, 21615/12; *GP* 248656, 260905, 264943, 267523, (*Fr.* 11, 335, 637, 635, 636)

Agfa, *GP* 229165, 232711, 233072, (*Fr.* 10, 730, 731, 733)

I.G., *BP* 322184; *FP* 673826; *GP* 492447 (*Fr.* 16, 1356)

Du Pont, *USP* 1095731, 1891447, 2150092

Cyanamid, *USP* 2289292

Allied Chem., *USP* 2473872

BIOS 987, 59; *FIAT* 1313, 2, 61

Fierz-David, *JSDC*, 51 (1935), 61

Mayer, 134

Fierz-David, *Suppl.* 88

Schultz, *Suppl.* 1, 46

Venkataraman, 1116

Insoluble in alcohol

H_2SO_4 conc. — yellow

$\text{Na}_2\text{S}_2\text{O}_4$, alkaline — violet; acid — dull orange

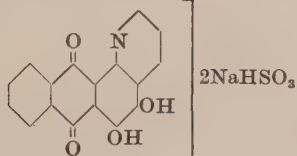
67301 C.I. Solubilised Vat Yellow 2 (Greenish yellow)

Leuco sulfuric ester of **C.I.67300**

Prepare by general methods — see **C.I.59051A**

Discoverers and references —

General — see **C.I.59051A**

67405 Mordant Dye**67405:1 C.I. Solvent Blue 76 (Blue)**

Heat a mixture of glycerol, 4-amino-1,2-dihydroxyanthraquinone and nitrobenzene with sulfuric acid and convert to the sodium bisulfite compound

Discoverer — R. Brasch 1892

Dull bluish green on chromium-mordanted wool and cotton

Fastness Properties on cotton (C): Chlorine 3, Light 6,

Washing 4 (*C.I.1068* (1st Edn.) — unconfirmed)

M.L.B., *BP* 14717/92; *USP* 569405; *FP* 223766; *GP* 67470 (*Fr.* 3, 252)

Badische Co., *GP* 17695, 23008, (*Fr.* 1, 168, 169)

FIAT 764 — Alizarinruen S

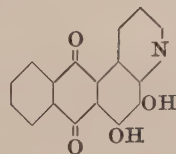
Barnett, 296

Houben, 672

Soluble in water

Insoluble in alcohol

H_2SO_4 conc. — cherry red (SO_2 evolved); on dilution — bluish green ppt.

67410 Mordant Dye

Heat a mixture of glycerol, 3-amino-1,2-dihydroxyanthraquinone and 1,2-dihydroxy-3-nitroanthraquinone with sulfuric acid; precipitate with water and wash free from acid

Discoverer — M. Prud'homme 1877

Alizarin Blue (B)

Reddish blue on chromium-mordanted wool

Fastness Properties (C): Carbonising 4, Decatising 4,

Light 7, Milling 5, Potting 5, Stoving 4, Washing 5

Caro, *USP* 186032

Orth, *GP* 62703 (*Fr.* 3, 247)

Knüppel, *GP* 87334 (*Fr.* 4, 1134)

BIOS 1484, 25

Graebe & Brunck, *Ber.* 11 (1878), 522

Vogel, *Ber.* 11 (1878), 1371

Koch, *Mon. sci.* 8 [3] (1878), 1163

Witz, *Bull. Soc. ind. Rouen*, (1878), 82

Graebe, *Ber.* 11 (1878), 1646; 12 (1879), 1416; 15 (1882), 1783;

17 (1884), 170; *Ann.* 201 (1880), 333

Auerbach, *JCS*, 35 (1879), 799; *Chem. Ztg.* 3 (1879), 525, 682

Scheurer, *Bull. Soc. ind. Mulhouse*, (1884), 327

Philips, *JSDC*, 9 (1893), 68

Prud'homme & Rabaut, *Bull. Soc. ind. Mulhouse*, (1893), 223

Knüppel, *Ber.* 29 (1896), 708

Hosoda, *J. Soc. Org. Synthetic Chem., Jap.* 9 (1951), 159; (*CA*, 47 (1953), 1391)

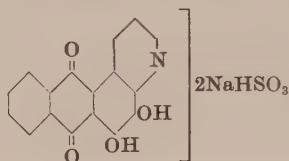
Barnett, 293

Houben, 666, 669

Kränzlein, 12

Slightly soluble in ethanol

H_2SO_4 conc. — crimson; on dilution — yellowish red

67415 C.I. Mordant Blue 27 (Chromium-Reddish navy)

Treat **C.I.67410** with sodium bisulfite with or without a solvent

Discoverer — H. Brunck 1881

Badische Co., *BP* 3603/81, 8303/90; *USP* 258530, 258531, 274081; *FP* 144386; *GP* 17695, 23008, (*Fr.* 1, 168, 169), 54390 (*Fr.* 2, 118)

Koenig, *BP* 4531/81; *USP* 263964, 263965

M.L.B., *BP* 627/82; *USP* 261600

BIOS 1484, 25

Brunck & Graebe, *Ber.* 15 (1882), 1783; *Ann.* 201 (1880), 333

Levinstein, *JSCI*, 2 (1883), 223

Knecht, *JSDC*, 2 (1886), 112

Hosoda, *J. Soc. Org. Synthetic Chem., Jap.* 9 (1951), 163; (*CA*, 47 (1953), 1391)

Barnett, 296

Houben, 672

Soluble in water

Insoluble in alcohol

H₂SO₄ conc. — dull yellow (SO₂ evolved); on dilution — brown ppt.

67420 Mordant Dye

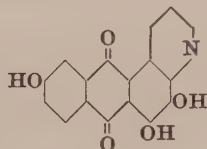
Condense **C.I.67410** with formaldehyde and convert to the bisulfite compound

Discoverers — R. E. Schmidt and P. Fischer 1905

Alizarin Grey SD (By)

For bluish grey to black prints on chromium-mordanted cotton

Bayer Co., *USP* 790079; *GP* 159724 (*Fr.* 8, 337)

67425 Mordant Dye

(a) Heat a mixture of glycerol and 1,2,6-trihydroxy-3-nitro-anthraquinone with sulfuric acid

(b) Heat a mixture of glycerol, 3-amino-1,2,6-trihydroxy-anthraquinone and nitrobenzene with sulfuric acid

Discoverer — H. Reisenegger 1890

Alizarin Black P (MLB)

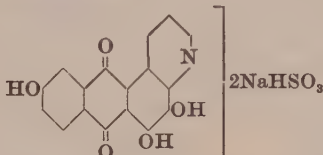
Bluish grey to black on chromium-mordanted cotton or wool or, when afterchromed, on wool of good fastness to chlorine, light, milling, and washing (*C.I.1069 (1st Edn.)* — unconfirmed)

M.L.B., *BP* 5780/90; *USP* 450037; *FP* 205076; *GP* 54624 (*Fr.* 2, 122)

Houben, 672

Slightly soluble in alcohol

H₂SO₄ conc. — dull reddish brown; on dilution — pale brown → brown ppt.

67430 Mordant Dye

Treat **C.I.67425** with sodium bisulfite until the product is soluble in water

Discoverer — H. Reisenegger 1890

Alizarin Black S (MLB)

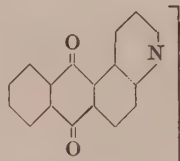
Grey to black on chromium-mordanted wool or cotton, fast to chlorine, light, and milling (*C.I.1070 (1st Edn.)* — unconfirmed)

M.L.B., *BP* 5780/90; *USP* 450037; *FP* 205076; *GP* 54624 (*Fr.* 2, 122)

Houben, 672

Soluble in water

H₂SO₄ conc. — brown (SO₂ evolved); on dilution — brown ppt.

67435 Mordant Dye

Mixed tri- and tetra-hydroxy monosulfonic acid compounds

Treat **C.I.67410** with fuming sulfuric acid

The ammonium bisulfite compound was Alizarin Green S (MLB)

Discoverer — R. Bohn 1888

Alizarin Green X (B)

Bluish green on chromium-mordanted wool fast to light, milling, and washing (*C.I.1071 (1st Edn.)* — unconfirmed)

Badische Co., *BP* 14353/88; *USP* 399479, 399480, 399481, 401633, 401635; *FP* 192582; *GP* 46654, 47252, (*Fr.* 2, 111, 116)

Knecht, *JSDC*, 5 (1889), 106, 171

Graebe, *Ber.* 23 (1890), 3739

Schmidt & Gattermann, *J. prakt. Chem.* 44 (1891) (2), 103

Graebe & Philips, *Ber.* 24 (1891), 2297; *Ann.* 276 (1893), 21

Houben, 671

Barnett, 296

Insoluble in water

H₂SO₄ conc. — dull bluish violet; on dilution — reddish brown ppt.

67440 C.I. Mordant Green 19 (Chromium-Bluish green)

Sodium bisulfite compound of **C.I.67435**

Render **C.I.67435** water soluble by the action of sodium bisulfite

Discoverer — R. Bohn 1888

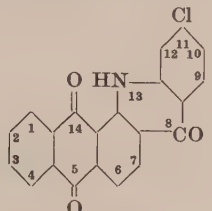
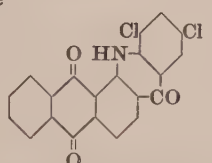
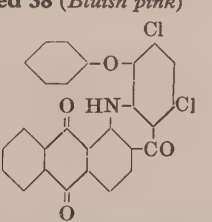
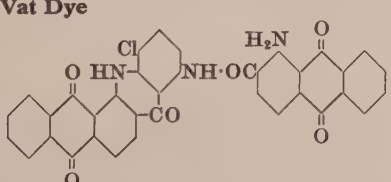
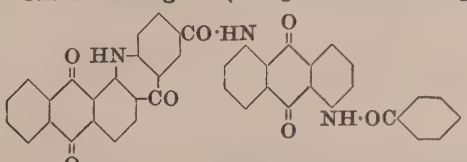
References as **C.I.67435**

Additional reference —

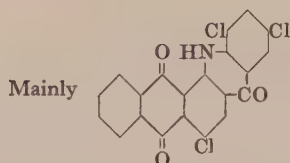
Ufimtsev, *J. Gen. Chem. (U.S.S.R.)* 22, 658 (*JSDC*, 68 (1952), 361)

Soluble in water

H₂SO₄ conc. — dull blue; on dilution — reddish blue ppt.

| | |
|---|--|
| 67445 Mordant Dye Mixture of compounds similar to but not identical with C.I.67435 Treat C.I.67410 with fuming and then with concentrated sulfuric acid | Alizarin Blue-Green (B) <i>Discoverer</i> — R. Bohn 1888 Alizarin Indigo Blue S (BASF) Blue on chromium-mordanted wool Badische Co., <i>BP</i> 15121/88; <i>USP</i> 399482; <i>FP</i> 192582 Knecht, <i>JSDC</i> , 5 (1889), 107, 171 Graebe, <i>Ber.</i> 23 (1890), 3739 Schmidt, <i>J. prakt. Chem.</i> 43 (1891) (2), 241 Graebe & Philips, <i>Ber.</i> 24 (1891), 2297 Philips, <i>JSDC</i> , 9 (1893), 69 Houben, 671 Barnett, 296 Fierz-David, 556 Fierz-David & Blangey, Table 20 |
| 67450 Mordant Dye Treat C.I.67445 with sulfuric acid and form the bisulfite compound Soluble in water H ₂ SO ₄ conc. — blue; on dilution — reddish violet ppt. | <i>Discoverer</i> — R. Bohn 1888 Alizarin Indigo Blue S (BASF) Blue on chromium-mordanted wool Badische Co., <i>BP</i> 15121/88; <i>USP</i> 399482; <i>FP</i> 192582 Knecht, <i>JSDC</i> , 5 (1889), 107, 171 Graebe, <i>Ber.</i> 23 (1890), 3739 Schmidt, <i>J. prakt. Chem.</i> 43 (1891) (2), 241 Graebe & Philips, <i>Ber.</i> 24 (1891), 2297 Philips, <i>JSDC</i> , 9 (1893), 69 Houben, 671 Barnett, 296 Fierz-David, 556 Fierz-David & Blangey, Table 20 |
| 67800 Vat Dye (Reddish violet)  (a) Condense 1-chloroanthraquinone with 2-amino-4-chlorobenzoic acid and cyclise (b) Chlorinate phthaloylacridone (naphth[2,3- <i>c</i>]acridine-5,8,14-(13 <i>H</i>)-trione) | <i>Discoverer</i> — A. Lüttringhaus Indanthren Violet RRR (B) Badische Co., <i>GP</i> 229394 (<i>Fr.</i> 10 , 601), 272297 (<i>Fr.</i> 11 , 669) M.L.B., <i>GP</i> 245875 (<i>Fr.</i> 10 , 719) Schaarschmidt, <i>Ann.</i> 405 (1915), 95 Fierz-David, 599 Houben, 688 Na ₂ S ₂ O ₄ , alkaline — violet |
| 67805 Vat Dye  | <i>Discoverer</i> — I.G. Indanthren Red RK New (IG) <i>FDX</i> 885 (<i>PB</i> 74735) — Indanthrenrot RK Neu |
| 67810 C.I. Vat Red 38 (Bluish pink)  Condense 3,5-dichloro-2-phenoxyaniline with methyl 1-chloro-2-anthraquinonecarboxylate. Hydrolyse and cyclise with benzoyl chloride in <i>o</i> -dichlorobenzene | <i>Discoverers</i> — W. Bauer, H. Hoyer, and B. Bollweg 1935 I.G., <i>BP</i> 458166; <i>USP</i> 2097112; <i>FP</i> 806629; <i>GP</i> 639732 (<i>Fr.</i> 22 , 1009) <i>BIOS</i> 1088, 13 <i>FIAT</i> 764 — Indanthrenbrillantrosa BL Venkataraman, 921 Na ₂ S ₂ O ₅ , alkaline — bordeaux; acid — dull orange |
| 67815 Vat Dye  Oxidise 2-methyl-1-nitroanthraquinone, condense with 2,5-dichloroaniline, ring close, aminate and condense with 1-amino-2-anthraquinone-carbonyl chloride | <i>Discoverer</i> — I.G. Indanthren Bordeaux BB (IG) <i>BIOS</i> 987, 5, 64 |
| 67820 C.I. Vat Orange 13 (Orange → Reddish orange)  Condense 1-nitro-2-anthraquinonecarboxylic acid with <i>p</i> -amino-benzoic acid, cyclise, convert to the acid chloride and condense with 1-amino-5-benzamidoanthraquinone in <i>o</i> -dichlorobenzene | <i>Discoverers</i> — P. Nawiasky, E. Krauch and W. Bauer 1930 I.G., <i>GP</i> 534934 (<i>Fr.</i> 18 , 1317) <i>BIOS</i> 987, 5, 63 <i>FIAT</i> 764 — Indanthrenorange RR Na ₂ S ₂ O ₄ , alkaline — bluish bordeaux; acid — orange brown |

67895 C.I. Vat Violet 14 (Reddish violet)



(a) Condense 1-chloroanthraquinone with anthranilic acid, chlorinate with sulfur chloride and iodine chloride in presence of nitrobenzene and cyclise

(b) Chlorinate phthaloylacridone (naphth[2,3-c]acridine-5,8,14-13H)-trione) to introduce approximately 3 atoms of chlorine

Note — The commercial product contains some dichloro compound

Discoverer — O. Bally 1910

Badische Co., BP 12653/09, 894/11, 17271/12; USP 961047, 993915, 1002066; 1010930, 1011068, 1150863; FP 408489, 425859; SwissP 56472; GP 221853, 237236, 237237, (Fr. 10, 703, 708, 710), 258561, 260428, 272296, (Fr. 11, 671, 726, 668), 275671, 283724, (Fr. 12, 472, 474)

Bayer Co., GP 286095 (Fr. 12, 471)

I.G., BP 260588; GP 522969 (Fr. 17, 1225), 529555 (Fr. 18, 1306)

FIAT 1313, 3, 39

FIAT 764 — Indanthrenrotviolett RRK

Ullmann & Ochsner, Ann. 381 (1911), 1

Fraser-Thomson, JSDC, 52 (1936), 241

Maki & Eguchi, JSCI, Jap. 44 (1941), 788 (CA, 42 (1948), 2105)

Fox, JSDC, 65 (1949), 515

Fierz-David, Suppl. 86

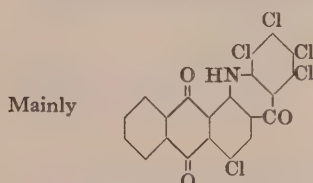
Thorpe, 1, 417

Soluble in tetrahydronaphthalene, xylene

H₂SO₄ conc. — orange; on dilution — reddish violet ppt.

Na₂S₂O₄, alkaline — violet; acid — brown

67900 C.I. Vat Red 39 (Bright bluish pink)



Convert 2-methyl-1-nitroanthraquinone to 1-amino-2-anthraquinone-carboxylic acid, condense with aniline, cyclise and chlorinate

Note — The 7,9,10,11,12-pentachloro isomer is stated to be present also

Discoverer — I.G. 1931

BIOS 987, 5

FIAT 764 — Indanthrenbrillantrosa BBL

Kunz, Text-Rund. 6 (1951), 544; Melliand. 33 (1952), 66

Na₂S₂O₄, alkaline — violet; acid — bluish red

67905 Vat Dye (Bluish pink)

The 6,7,9,10,11,12-hexachloro compound related to C.I. 67900

(a) Convert 2-methyl-1-nitroanthraquinone to 1-amino-2-anthraquinone-carboxylic acid, condense with aniline, cyclise and chlorinate

(b) Convert 2-methyl-1-nitroanthraquinone to 1-anilino-2-methyl-anthraquinone, then cyclise and chlorinate in one step

Discoverer — I.G.

Indanthren Pink B (IG)

Application method A/Q3

Fastness Properties (C): Chlorine 4-5, Light 7, Soda boil 2

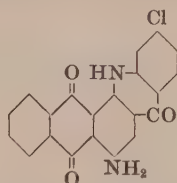
BIOS 987, 5

Soluble in tetrahydronaphthalene, xylene

H₂SO₄ conc. — dull red; on dilution — bluish red ppt.

Na₂S₂O₄, alkaline — violet; acid — orange

67910 C.I. Vat Blue 32 (Greenish blue)



Condense 1-amino-4-bromo-2-anthraquinonesulfonic acid with 2-amino-4-chlorobenzoic acid and cyclise, simultaneously eliminating the sulfonic acid group

Discoverer — R. Berliner 1928

I.G., BP 327967; USP 1851082; GP 531013 (Fr. 18, 1312)

FIAT 764 — Indanthrentuerkisblau GK

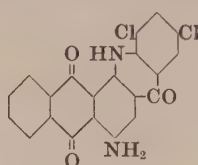
Joshi, Bombay Technologist, 2 (1952) 78 (CA, 48 (1954), 1688)

Fox, JSDC, 65 (1949), 515

H₂SO₄ conc. — orange; on dilution — blue

Na₂S₂O₄, alkaline — dull violet; acid — yellow

67915 C.I. Vat Blue 33 (Bright greenish blue)



(a) Treat C.I.67895 with *p*-toluenesulfonamide and hydrolyse
(b) Treat 1-amino-4-bromo-2-anthraquinonesulfonic acid with a mixture of 3-chloro- and 3,5-dichloro-2-aminobenzoic acid, split off the sulfonic acid group and cyclise

Discoverer — H. Neresheimer 1912

Badische Co., BP 17764/14; USP 1052507, 1207982; SwissP 61704, 70443; GP 287614 (Fr. 12, 477)

I.G., BP 327967, 334240; USP 1850482, 1851082; GP 531013 (Fr. 18, 1312)

FIAT 764 — Indanthrentuerkisblau 3GK

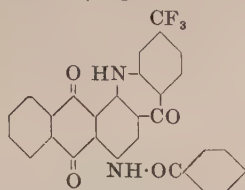
Joshi, Bombay Technologist, 2 (1952) 78 (CA, 48 (1954), 1688)

Fierz-David, Suppl. 86

Soluble in tetrahydronaphthalene, xylene

H₂SO₄ conc. — orange yellow

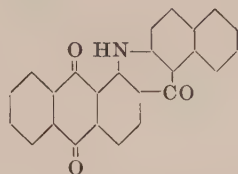
Na₂S₂O₄, alkaline — reddish brown; acid — olive → yellowish brown

67920 C.I. Vat Blue 21 (Bright blue → Bright reddish blue)

Condense 1-amino-4-bromo-2-anthraquinonesulfonic acid with 2-amino-4-trifluoromethylbenzoic acid. Cyclise, simultaneously eliminating the sulfonic acid group, and benzoylate

Discoverers — H. Schlichenmaier and L. Berlin 1937

I.G., *USP* 2204232; *FP* 837183; *GP* 693610 (*Fr.-Bayer*, I-2, 351)
Du Pont, *USP* 2061186
BIOS 1493, 34; *BIOS-MISC* 20, App. 40; *FIAT* 1313, 2, 143

68000 C.I. Vat Red 35 (Dull red)

(a) Condense 1-chloro-2-anthraquinonecarboxylic acid with 2-naphthylamine in presence of copper and cyclise

(b) Heat 1-(2-naphthylamino)-2-anthraquinonecarbonyl chloride in trichlorobenzene

(c) Heat 1-nitro-2-anthraquinonecarboxylic acid and 2-naphthylamine with arsenic trichloride in *o*-dichlorobenzene

(d) Condense 2-amino-1-naphthalenesulfonic acid with 1-chloro-2-anthraquinonecarboxylic acid, cyclise by heating to 200–210°C, simultaneously eliminating the sulfonic acid group

Discoverer — A. Lüttringhaus 1910

Badische Co., *BP* 894/11; *USP* 1011068; *FP* 425859; *GP* 237236, 237237, 242063, (*Fr.* 10, 708, 710, 715), 248170 (*Fr.* 11, 666)

Bayer Co., *GP* 286095 (*Fr.* 12, 471)

Scottish Dyes, *BP* 207840, 318090; *USP* 1504164

I.G., *BP* 260588

Brit. Aliz., *BP* 324084

Morton Sundour, *BP* 340267

I.C.I., *BP* 691118

BIOS 1493, 41

FIAT 764 — Indanthrenrot RK

Ullmann, *Ann.* 381 (1911), 8

Ullmann & Bincer, *Ber.* 49 (1916), 748

Fraser-Thomson, *JSDC*, 52 (1936), 241

Krolik, *Org. Chem. Ind. U.S.S.R.* 1 (1936), 24 (*BCA*, 1938, B, 890)

Truttwin, 365

Barnett, 312

Fierz-David, 599

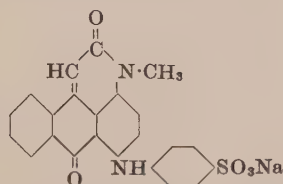
Houben, 688

Thorpe, 1, 417

Slightly soluble in pyridine, tetrahydronaphthalene, xylene

H₂SO₄ conc. — reddish yellow; on dilution — red ppt.

Na₂S₂O₄, alkaline — bluish red; acid — dull orange

68200 C.I. Acid Red 81 (Bright bluish red)

Condense 1-bromo-4-(*N*-methylacetamido)anthraquinone to 4-bromo-*N*-methyl-1(*N*),9-anthrapyridone. Condense with aniline, sulfonate with oleum and convert to the sodium salt

Discoverer — P. Thomaschewski 1906

Bayer Co., *BP* 28765/06, 486/08, 1678/08, 18107/08, 1212/10; *USP* 994803, 995306, 1004107; *FP* 372676; *GP* 192201, 201904, 209033, (*Fr.* 9, 732, 736, 736), 233126 (*Fr.* 10, 609)

Badische Co., *BP* 19172/07; *FP* 356606; *GP* 205095 (*Fr.* 9, 739)

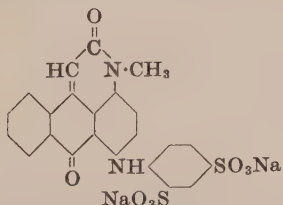
BIOS 1484, 47; *FIAT* 1313, 2, 217

FIAT 764 — Alizarinrubinol GW

Houben, 646

Soluble in alcohol

H₂SO₄ conc. — bluish red; on dilution — pink

68205 C.I. Acid Red 82 (Bright bluish red)

Condense 4-bromo-*N*-methyl-1(*N*),9-anthrapyridone with aniline, disulfonate with oleum and convert to the sodium salt

Discoverer — P. Thomaschewski 1906

Bayer Co., *BP* 486/08; *GP* 201904 (*Fr.* 9, 736), 233126 (*Fr.* 10, 609)

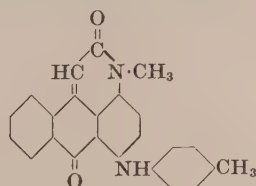
BIOS 1484, 40; *FIAT* 1313, 2, 219

FIAT 764 — Alizarinrubinol 3G

Fierz-David, 624

Only very slightly soluble in alcohol

H₂SO₄ conc. — bluish red; on dilution — pink

68210 C.I. Solvent Red 52 (Bluish red)

(a) Condense 4-bromo(or chloro)-*N*-methyl-1(*N*),9-anthrapyridone with *p*-toluidine

(b) Ring close 1-(*N*-methylacetamido)-4-*p*-toluidinoanthraquinone to the anthrapyridone

Discoverer — P. Thomaschewski 1906

Bayer Co., *BP* 28765/06, 486/08, 1678/08, 18107/08, 1212/10; *USP* 994803, 995306, 1004107; *FP* 372676, 422047; *GP* 192201, 201904, 203752, 209033, (*Fr.* 9, 732, 736, 735, 736), 233126 (*Fr.* 10, 609)

Badische Co., *BP* 19172/07; *FP* 356606; *GP* 205095 (*Fr.* 9, 739)

Brit. Dye. Corp., *BP* 308049

BIOS 1484, 46; *FIAT* 1313, 2, 219

Fierz-David, 623

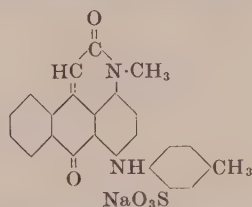
Houben, 646

Fierz-David & Blangey, Table 18

Thorpe, 1, 406

Solubilities. *See* Solvent section (Vol. 2, p. 2859)

H₂SO₄ conc. — deep red; on dilution — red ppt.

68215 C.I. Acid Red 80 (Bright bluish red)

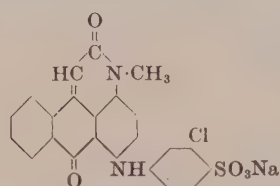
Sulfonate **C.I.68210** and convert to the sodium salt

Discoverer and references as for **C.I.68210**

Additional reference —

FIAT 764 — Alizarinrubinol R, Anthralanrot 3B

Soluble in *o*-chlorophenol, pyridine (hot)
Slightly soluble in alcohol, pyridine (cold)
Insoluble in acetone, chloroform, toluene
 H_2SO_4 conc. — magenta red; on dilution — pink → bluish red ppt.

68220 C.I. Acid Red 83 (Bright red)

Treat 4-bromo-*N*-methyl-1(*N*),9-anthrapyridone with *m*-chloroaniline in presence of sodium acetate, sulfonate with monohydrate, and convert to the sodium salt

Discoverer — P. Thomaschewski 1910

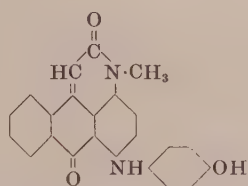
Bayer Co., *BP* 486/08; *GP* 201904 (*Fr.* 9, 736)

BIOS 1484, 40

FIAT 764 — Alizarinrubinol 5G

Fierz-David, 624

Soluble in alcohol
 H_2SO_4 conc. — blue; on dilution — yellowish red

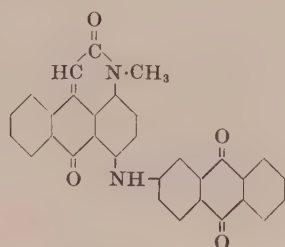
68225 Disperse Dye

Brominate *N*-methyl-1(*N*),9-anthrapyridone and condense with *p*-aminophenol

Discoverer — I.G.

Perlon Fast Red Violet R (IG)

BIOS 1120, 14; *BIOS-MISC* 20, 31

68230 Vat Dye (Bluish red)

Brominate *N*-methyl-1(*N*),9-anthrapyridone and condense with 2-aminoanthraquinone

Discoverer — P. Thomaschewski 1907

Algol Red B (By)

Application method A/Q3

Fastness Properties (C): Chlorine 4, Light 5, Soda boil 4

Bayer Co., *BP* 13686/07; *USP* 875390; *FP* 381214; *GP* 194253, 199901, (*Fr.* 9, 758, 761)

Vlies, *JSDC*, 30 (1914), 29

Barnett, 235

Fierz-David, 582 and Suppl. 71

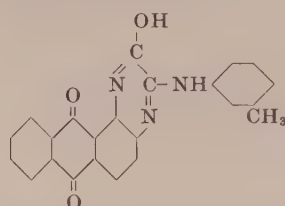
Houben, 467, 646

Mayer, 181

Rowe, *RIC lectures*, 93

Thorpe 1, 420

Soluble in tetrahydronaphthalene, xylene
 H_2SO_4 conc. — reddish violet; on dilution — red ppt.
 $\text{Na}_2\text{S}_2\text{O}_4$, alkaline — brownish red; acid — brownish yellow

68300 C.I. Vat Red 40 (Bright red)

Condense 1,2-(dihydroxypyrazino)anthraquinone with *m*-toluidine

Discoverers — H. Neresheimer, W. Ruppel, and W. Eichholz 1936

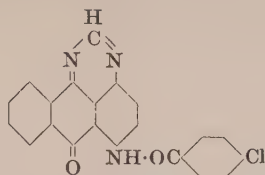
I.G., *GP* 651750, 656381 (*Fr.* 24, 878, 881)

BIOS 987, 81, 154; *FIAT* 1313, 2, 97

FIAT 764 — Indanthrenbrillantscharlach RK

$\text{Na}_2\text{S}_2\text{O}_4$, alkaline — reddish brown; acid — orange

68400 C.I. Vat Yellow 29 (*Bright greenish yellow*)

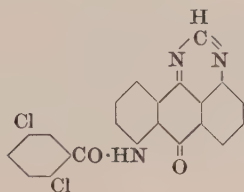


Acylate 4-amino-1,9-anthrapyrimidine with *p*-chlorobenzoyl chloride in the presence of pyridine

Discoverers — M. A. Kunz and K. Köberle 1931
I.G., *BP* 385295; *GP* 573556 (*Fr.* 19, 2021), 633207 (*Fr.* 21, 1143)
BIOS 987, 89, 173
FIAT 764 — Indanthrenelb 7GK
Sunthakar, *Proc. Ind. Acad. Sci.* 32A (1950), 240

M.p. 317–319°C (*GP* 633207)
H₂SO₄ conc. — golden yellow
Na₂S₂O₄, alkaline — reddish brown; acid — brown

68405 C.I. Vat Yellow 31 (*Yellow*)

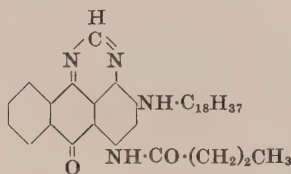


Acylate 5-amino-1,9-anthrapyrimidine with 2,5-dichlorobenzoyl chloride

Discoverers — M. A. Kunz and K. Köberle 1931
I.G., *BP* 385295; *GP* 566474 (*Fr.* 19, 2024), 573556 (*Fr.* 19, 2021)
633207 (*Fr.* 21, 1143)
BIOS 987, 95, 173
FIAT 764 — Indanthrenelb 4GK
Sunthakar, *Proc. Ind. Acad. Sci.* 32A (1950), 240

M.p. 287°C (*GP* 633207)
Na₂S₂O₄, alkaline — reddish brown; acid — brown

68410 Solvent Dye

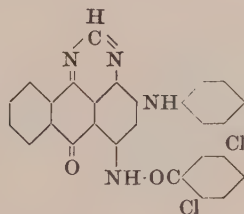


Treat 4-amino-2-bromo-1,9-anthrapyrimidine with octadecylamine and butyryl chloride

Discoverer — I.G.
Fluorol 242 (IG) — For colouring oils
BIOS 987, 174, 187

Soluble in oils with strong fluorescence
Insoluble in water

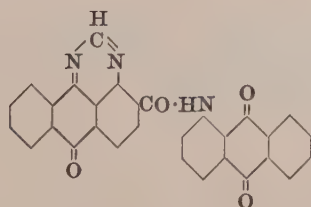
68415 C.I. Solvent Red 114 (*Yellowish red*)



Condense 2,4-dibromo-1,9-anthrapyrimidine with ammonia, then with aniline and finally with 2,5-dichlorobenzoyl chloride

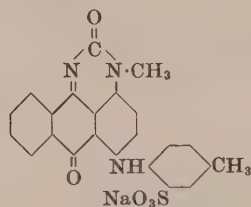
Discoverer — I.G.
C.I.O.S. XXVII-84, 57; *BIOS* 987, 175

68420 C.I. Vat Yellow 20 (*Yellow*)
C.I. Pigment Yellow 108 (*Yellow*)



Discoverer — Badische Co.
Kunz, *Text-Rund.* 6 (1951), 545; *Melliand.* 33 (1952), 67

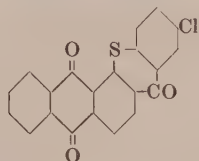
Na₂S₂O₄, alkaline — reddish brown; acid — reddish orange

68500 C.I. Acid Violet 39 (Reddish violet)

Condense 1-methylamino-4-*p*-toluidinoanthraquinone with urea in presence of boiling phenol, sulfonate and convert to the sodium salt

Discoverer — P. Thomaschewski 1912
 Bayer Co., *BP* 5998/09; *USP* 928891; *FP* 400500; *GP* 220314
 (*Fr.* 9, 742), 225982 (*Fr.* 10, 752)
FIAT 1313, 2, 231
FIAT 764 — Alizarinastrolviolet B
 Rowe, *RIC lectures*, 82
Fierz-David, 626
Houben, 651
Fierz-David & Blangey, Table 18

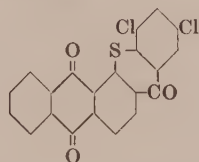
Soluble in alcohol
 H_2SO_4 conc. — deep blue; on dilution — pure blue

68600 Vat Dye (Reddish orange)

Treat 1-chloro-2-anthraquinonecarboxylic acid with *p*-chlorothiophenol and caustic potash, and cyclise

Discoverer — A. Lüttringhaus 1911
Indanthren Golden Orange RN (B)

Application method A/Q3
 Badische Co., *BP* 894/11, 15205/11; *USP* 1002066, 1010930,
 1011068, 1018836, 1018837, 1026621; *FP* 425859; *GP* 237236,
 243750, (*Fr.* 10, 708, 726)
FDX 885 (*PB* 74778) — Indanthrengoldorange RN

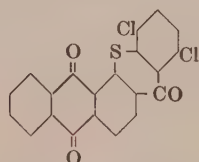
68605 Vat Dye (Yellow)

(a) Condense 1-chloro-2-anthraquinonecarboxylic acid with 2,4-dichlorothiophenol and cyclise

(b) Treat 1-diazo-2-anthraquinonecarboxylic acid with 2,4-dichlorothiophenol and cyclise

Discoverers — A. Lüttringhaus, E. Schwarz, and H. Diesbach 1911
Indanthren Yellow GN (B)

Badische Co., *BP* 15205/11; *USP* 1044673, 1044674, 1044675;
FP 425859; *GP* 243750 (*Fr.* 10, 726), 258561 (*Fr.* 11, 671)
 Scottish Dyes, *BP* 207840; *USP* 1504164
 Ullmann, *Ber.* 43 (1910), 539
 Schaarschmidt, *Ann.* 409 (1915), 59
 Barnett, 317
Fierz-David, 604
 Truttwin, 394
Houben, 693

68610 Vat Dye (Yellow)

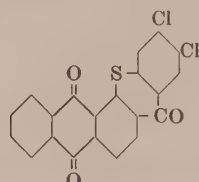
(a) Condense 1-chloro-2-anthraquinonecarboxylic acid with 2,5-dichlorothiophenol, and cyclise

(b) Treat 1-diazo-2-anthraquinonecarboxylic acid with 2,5-dichlorothiophenol and cyclise

Discoverers — A. Lüttringhaus, E. Schwarz, and H. Diesbach 1911
Indanthren Yellow GN Extra (B)

Application method A/Q3
 Badische Co., *BP* 15205/11; *USP* 1044674; *FP* 425859; *GP* 243750
 (*Fr.* 10, 726), 258561 (*Fr.* 11, 671)
 Scottish Dyes, *BP* 207840; *USP* 1504164
 I.G., *GP* 475688 (*Fr.* 16, 1360), 516398 (*Fr.* 17, 1407)
 Ullmann, *Ber.* 43 (1910), 539
 Schaarschmidt, *Ann.* 409 (1915), 59
 Barnett, 317
Fierz-David, 604

H_2SO_4 conc. — brown; on dilution — orange ppt.
 $\text{Na}_2\text{S}_2\text{O}_4$, alkaline — violet

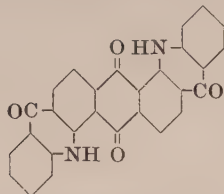
68615 Vat Dye (Reddish yellow)

Condense 1-chloro-2-anthraquinonecarboxylic acid with 3,4-dichlorothiophenol and cyclise

Discoverers — A. Lüttringhaus, E. Schwarz, and H. Diesbach 1911
Indanthren Golden Orange GN (B)

Badische Co., *BP* 15205/11; *USP* 1044673, 1044674, 1044675;
GP 243750 (*Fr.* 10, 726), 258561 (*Fr.* 11, 671)
 Scottish Dyes, *BP* 207840; *USP* 1504164
 I.G., *GP* 475688 (*Fr.* 16, 1360), 516398 (*Fr.* 17, 1407)
 Ullmann, *Ber.* 43 (1910), 539
 Schaarschmidt, *Ann.* 409 (1915), 59
 Truttwin, 720
 Barnett, 317
Fierz-David, 604

$\text{Na}_2\text{S}_2\text{O}_4$, alkaline — violet

68700 C.I. Vat Violet 13 (Bluish violet)

Condense 1,5-dichloroanthraquinone with potassium anthranilate in presence of copper and cyclise

Notes — A solubilised form has been prepared¹
Bromo compounds have been prepared by bromination in nitrobenzene in the presence of iodine²

Slightly soluble in pyridine, tetrahydronaphthalene, xylene
H₂SO₄ conc. — orange; on dilution — violet ppt.
Na₂S₂O₄, alkaline — dull blue; acid — brown

Discoverer — F. Ullmann 1909

Agfa, BP 12653/09; USP 961047, 961048; FP 408489; GP 221853 (Fr. 10, 703)
Badische Co., BP 13907/09; USP 1086123; GP 234977, 246966, (Fr. 10, 713, 725), 249238 (Fr. 11, 685)
I.G., BP 322750; GP 503205 (Fr. 17, 1227)
BIOS 1493, 51; FIAT 1313, 2, 171
FIAT 764 — Indanthrenviolet FFBN
Ullmann, Ber. 43 (1910), 536
Ullmann & Sonc, Ann. 380 (1911), 336
Ullmann & Knecht, Ber. 44 (1911), 3125
Ullmann & Ochsner, Ann. 381 (1911) (1), 10
Fraser-Thomson, JSDC, 52 (1936), 241
Truttwin, 372
Barnett, 313
Fierz-David, 601, 603
Houben, 688
Mayer, 209
Thorpe, 1, 417
Notes¹ BIOS 987, 178
²Agfa, BP 22780/10; USP 1008906; FP 420399; GP 233038 (Fr. 10, 704)

68705 Vat Dye (Dull blue)

Classical name **Cyananthrene O**



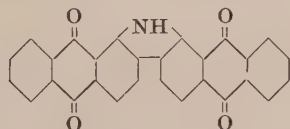
Treat 2-aminoanthraquinone with glycerol in presence of sulfuric acid and fuse the product with potassium hydroxide

Discoverers — O. Bally and M. H. Isler 1904

Indanthren Dark Blue BT (B)

Badische Co., BP 16538/04; USP 786085, 809892, 811471, 818336; FP 349531; GP 171939, 172609, (Fr. 8, 369, 371), 176019 (Fr. 8, 374), 188193 (Fr. 9, 828)
Bally, Ber. 38 (1905), 196
Brown, JSDC, 22 (1906), 11
Bally & Scholl, Ber. 44 (1911), 1656
Formánek, Chem. Ztg. 41 (1917), 713
Maki, JSCI, Jap. 37 (1934), 224B
Fraser-Thomson, JSDC, 52 (1936), 248
Pandit, Tilak & Venkataraman, Proc. Ind. Acad. Sci. 32A (1950), 39 (CA, 45 (1951), 6180)
Bradley & Sutcliffe, JCS, (1952), 2118

Soluble in xylene (bluish red with red fluorescence)
Slightly soluble in alcohol (yellow with green fluorescence), chloroform, *o*-chlorophenol
H₂SO₄ conc. — dull green; on dilution — dull violet ppt.
Na₂S₂O₄, alkaline — reddish blue

69000 C.I. Vat Yellow 28 (Reddish yellow)

(a) Cyclise 1,1'-dianthrimide with sulfuric acid or aluminium chloride

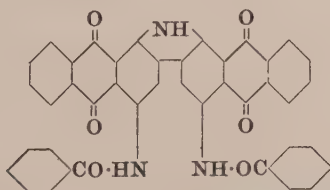
(b) Heat 2-chloro-1-nitroanthraquinone in nitrobenzene with copper and reduce to 1,1'-diamino-2,2'-bianthraquinone. Cyclise with sulfuric acid or zinc chloride

(c) Treat 2-bromo-1,1'-dianthrimide with copper in nitrobenzene

Discoverers — E. Hepp, R. Uhlenhuth, and F. Römer 1911

M.L.B., BP 23110/11, 238523; USP 1052480; GP 240080 (Fr. 10, 639), 251021, 267522, 267833, (Fr. 11, 616, 620, 619), 430559 (Fr. 15, 704)
I.G., GP 451495 (Fr. 16, 1345)
BIOS 1493, 53
FIAT 764 — Indanthrengelb FFRK
Bradley & Thitchener, JCS (1953), 1085
Fierz-David, 605
Mayer, 181
Thorpe, 1, 421

Soluble in tetrahydronaphthalene, xylene
H₂SO₄ conc. — brownish red; on dilution — orange ppt.
Na₂S₂O₄, alkaline — reddish brown; acid — yellowish brown (green fluorescence)

69005 C.I. Vat Black 27 (Brownish grey)

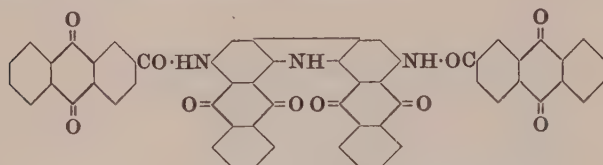
(a) Condense 1-benzamido-4-chloroanthraquinone with 1-amino-4-benzamidoanthraquinone in presence of copper followed by the action of chlorosulfonic acid

(b) Cyclise 4,4'-dibenzamido-1,1'-dianthrimide in sulfuric acid and oxidise the product

Discoverer — W. Mieg 1910

Bayer Co., BP 2702/09, 11932/09, 25986/09, 29352/10, 15753/12; USP 986521, 996109; FP 400653, 409407, 432449; SwissP 55556; GP 220581, 225232, (Fr. 9, 764, 1197), 228992, 239544, (Fr. 10, 644, 638), 464292, (Fr. 16, 1354)
Brit. Dye. Corp., BP 289191
BIOS 1493, 29; FIAT 1313, 2, 135 (for method)
FIAT 764 — Indanthrenoliv R
Vlies, JSDC, 30 (1914), 29
Fraser-Thomson, JSDC, 52 (1936), 242
Fierz-David, 584 and Suppl. 82
Houben, 466, 662
Mayer, 181
Fierz-David & Blangey, Table 19
Thorpe, 1, 422

Soluble in *o*-chlorophenol
Slightly soluble in chloroform, pyridine
Insoluble in acetone, alcohol, toluene, xylene
H₂SO₄ conc. — red; on dilution — flocculent olive green ppt.
Na₂S₂O₄, alkaline — reddish brown; acid — yellowish brown

69010 C.I. Vat Green 17 (Greenish grey)

Condense 4,4'-diamino-1,1'-dianthrimide with 2 mol. 2-anthraquinonecarbonyl chloride and cyclise

Discoverer — F. Baumann 1929

I.G., BP 349714; USP 1819014; GP 513608 (Fr. 17, 1398)

BIOS 1493, 28

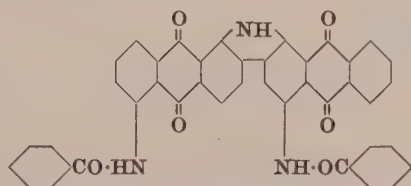
FIAT 764 — Indanthrenoliv 3G

H₂SO₄ conc. — yellowish brown

Na₂S₂O₄, alkaline — reddish brown; acid — brownish yellow

69015 C.I. Vat Brown 3 (Brown)

C.I. Pigment Brown 28 (Brown)



Condense 1-benzamido-5-chloroanthraquinone with 1-amino-4-benzamidoanthraquinone in presence of copper followed by the action of sulfuric acid

Discoverer — W. Mieg 1910

Bayer Co., BP 2702/09, 11932/09, 25986/09, 29138/09, 29352/10, 15753/12; FP 400653, 432449; GP 220581, 225232, (Fr. 9, 764, 1197), 228992, 239544, (Fr. 10, 644, 638), 491428 (Fr. 16, 1349)

Brit. Dye. Corp., BP 289191

BIOS 1493, 10, 12; FIAT 1313, 2, 106

FIAT 764 — Indanthrenbraun R, FFR

Fraser-Thomson, JSDC, 52 (1936), 243

Fierz-David, 576 and Suppl. 82

Mayer, 181

Thorpe, 1, 422

Slightly soluble in xylene

H₂SO₄ conc. — dull wine red; on dilution — reddish brown flocculent ppt.

Na₂S₂O₄, alkaline — reddish brown; acid — yellowish brown

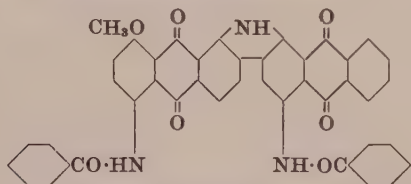
69016 C.I. Solubilised Vat Brown 3 (Brown)

Leuco sulfuric ester of C.I.69015

Prepare by general methods — see C.I.59051A

Discoverers and references —

General — see C.I.59051A

69020 C.I. Vat Brown 25 (Reddish brown)

Condense 1-amino-4-benzamidoanthraquinone with 1-benzamido-5-chloro-4-methoxyanthraquinone and cyclise

Discoverer — F. Baumann 1926

I.G., BP 298696; USP 1885172; GP 481362 (Fr. 16; 1326)

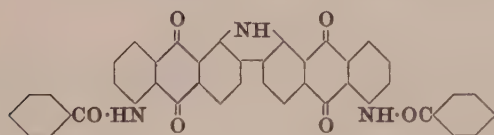
BIOS 1493, 44

FIAT 764 — Indanthrenrotbraun 5RF

Fox, JSDC, 65 (1949), 513

H₂SO₄ conc. — violet; on dilution — red

Na₂S₂O₄, alkaline — reddish brown; acid — brown

69025 C.I. Vat Orange 15 (Yellowish orange)

Treat 5,5'-dibenzamido-1,1'-dianthrimide with sulfuric acid and oxidise

Discoverer — S. Gassner 1924

Bayer Co., USP 1667848; SwissP 115114

Cassella Co., GP 239544, 249000, (Fr. 11, 621, 621)

BIOS 1493, 15; FIAT 1313, 2, 119 (for method)

FIAT 764 — Indanthrengoldorange 3G

Müller, Text-Rund. 5 (1950), 306

Fierz-David Suppl. 82

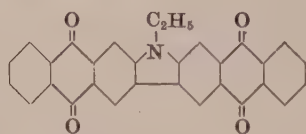
Thorpe, 1, 423

Venkataraman, 902

Slightly soluble in nitrobenzene, tetrahydronaphthalene, xylene Insoluble in alcohol

H₂SO₄ conc. — greenish blue; on dilution — orange

Na₂S₂O₄, alkaline — brown; acid — dull yellow

69400 Vat Dye (Yellow)

Condense phthalic anhydride with N-ethylcarbazole in presence of aluminium chloride and eliminate water by treatment with sulfuric acid

Discoverers — D. Nissen and E. Saul 1911

Hydron Yellow G (C)

Cassella Co., BP 28874/11; USP 1055287; FP 449194; GP 261495 (Fr. 11, 621)

Badische Co., BP 22836/13; USP 1196127; FP 463508; GP 275670 (Fr. 12, 466)

Fierz-David, 606

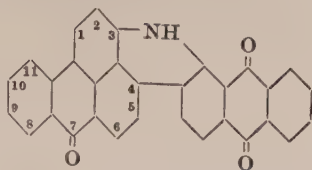
Houben, 629

Thorpe, 1, 423

Slightly soluble in tetrahydronaphthalene, xylene (with green fluorescence)

H₂SO₄ conc. — reddish violet

Na₂S₂O₄, alkaline — dark brown; acid — brown

69500 C.I. Vat Green 3 (Dull green)

Condense 3-bromobenzanthrone with 1-aminoanthraquinone in boiling naphthalene in the presence of sodium carbonate and copper oxide. Cyclise with caustic potash in isobutyl alcohol

Discoverer — H. Wolff 1908

Badische Co., *BP* 24604/08; *USP* 995936; *GP* 212471 (*Fr.* 9, 834) I.G., *GP* 499352, 504016, 507344, 509422, (*Fr.* 17, 1384, 1372, 1373, 1376)

Hironaka & Tono, *Jap.P* 172744

Ciba, *BP* 613836

Gen. Anil., *USP* 2392794

Cyanamid., *USP* 2483238

BIOS 987, 71

FIAT 764 — Indanthrenolivgruen B

Maki & Kikuchi, *JSCI, Jap.* 42 (1939), 316B (*JSDC*, 56 (1940), 83)

Müller, *Melliand.* 28 (1947), 93

Maki & Mine, *JCS, Jap. (Ind. Chem. Sect.)*, 51 (1948), 13 (*CA*, 44 (1950), 9151)

Soluble in pyridine

Insoluble in alcohol

H₂SO₄ conc. — bright yellowish green; on dilution — olive green

Na₂S₂O₄, alkaline — dark blue; acid — dull brown

69501 C.I. Solubilised Vat Green 3 (Dull green)

Leuco sulfuric ester of **C.I.69500**

Prepare by general methods — see **C.I.59051A**

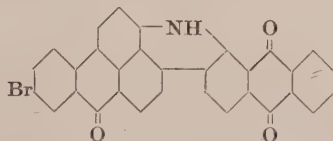
Discoverers and references —

General — see **C.I.59051A**

Additional —

BIOS 1493, 70

FIAT 764 — Anthrasololivgruen IB

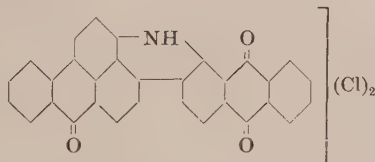
69505 Pigment

Condense 3,9-dibromobenzanthrone with 1 mol. 1-aminoanthraquinone in boiling naphthalene in the presence of sodium carbonate and copper oxide. Cyclise with caustic potash in isobutyl alcohol

Discoverer — I.G.

Spinning Green BA (IG) — For incorporation in acetate melt before spinning

FIAT 1313, 3, 381

69510 Vat Dye

Chlorinate **C.I.69500**

Note — Parent dye for the preparation of **C.I.69511**

Discoverers — E. Honold and R. Müller 1933

I.G., *BP* 423450; *USP* 2022240; *GP* 602402 (*Fr.* 21, 1138)

69511 Solubilised Vat Dye

Leuco sulfuric ester of **C.I.69510**

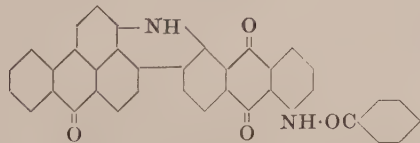
Prepare by general methods — see **C.I.59051A**

Discoverers and references —

General — see **C.I.59051A**

Additional — *FDX* 885 (*PB* 82175) — Anthrasolgrün IBT

Anthrasol Green IBT (IG)

69515 Vat Dye (Olive)

Condense 3-bromobenzanthrone with 1,5-diaminoanthraquinone in boiling naphthalene with copper oxide and sodium carbonate. Cyclise and benzoylate

Discoverers — W. Zerweck and E. Honold 1928

Indanthren Olive GB (IG)

Application method A/Q1

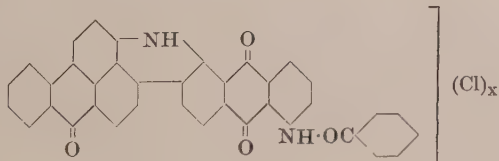
Fastness Properties (C): Chlorine 3, Light 8, Soda boil 4-5

I.G., *BP* 305679, 339396; *USP* 1819053; *GP* 504016, 520876, (*Fr.* 17, 1372, 1382)

BIOS 987, 6, 73; *BIOS* 1493, 32

FIAT 764 — Indanthrenoliv GB

Na₂S₂O₄, alkaline — dark blue

69520 C.I. Vat Green 5 (Olive)

Discoverers — W. Zerweck and E. Honold 1928

Badische Co., *GP* 212471 (*Fr.* 9, 834)

I.G., *BP* 305679, 349115; *USP* 1819053, 1994025; *GP* 504016, 507344, 509422, (*Fr.* 17, 1372, 1373, 1376)

Hironaka & Tono, *Jap.P* 172744

Ciba, *BP* 613836

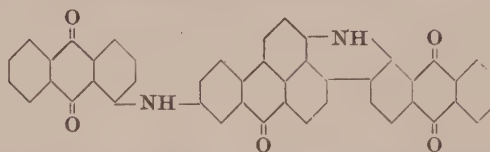
Gen. Anil., *USP* 2392794

BIOS 987, 6, 73

FIAT 764 — Indanthrenolivgruen GG

Maki & Kikuchi, *JSCI, Jap.* 42 (1939), 316B

Na₂S₂O₄, alkaline — dark blue; acid — dull reddish brown

69525 C.I. Vat Black 25 (Brownish grey)

Discoverers — H. Wolff and E. Honold 1929
 I.G., BP 337741; USP 1845469; GP 517442 (*Fr.* 17, 1364)
 BIOS 987, 7, 76; FIAT 1313, 2, 140, 195
 FIAT 764 — Indanthrenoliv T
 Venkataraman, 982

Condense 2 mol. 1-aminoanthraquinone with 3,9-dibromobenzanthrone in boiling naphthalene with copper oxide and sodium carbonate. Cyclise with caustic potash in boiling isobutyl alcohol

H₂SO₄ conc. — green; on dilution — black ppt.
 HNO₃ conc. — reddish brown
 Na₂S₂O₄, alkaline — grey; acid — dull olive

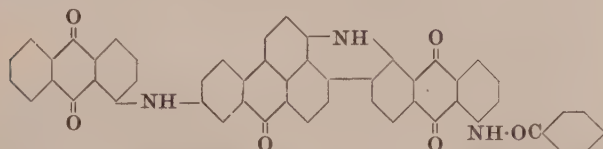
69526 C.I. Solubilised Vat Black 25 (Brownish grey)

Leuco sulfuric ester of C.I.69525

Prepare by general methods — see C.I.59051A

Discoverers and references —

General — see C.I.59051A

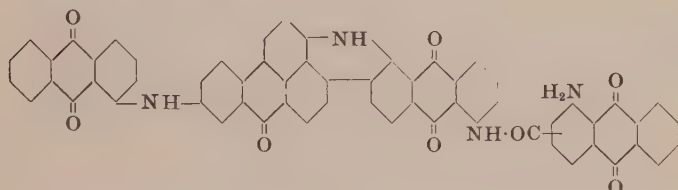
69530 Vat Dye (Dull brown)

Discoverer — E. Honold 1935

Indanthren Olive Brown GB (IG)

I.G., BP 470531; USP 2131176; GP 650230 (*Fr.* 24, 896)
 BIOS 987, 7
 Venkataraman, 982

Condense 3,9-dibromobenzanthrone with 1-amino-5-benzamidoanthraquinone and 1-aminoanthraquinone in naphthalene in the presence of copper oxide and sodium carbonate, and cyclise

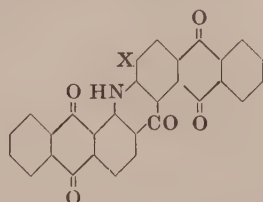
69535 Vat Dye

Discoverer — E. Honold 1935

Indanthren Black Brown NR (IG)

I.G., BP 470531; USP 2131176; GP 650230 (*Fr.* 24, 896)
 BIOS 987, 7
 Venkataraman, 982

Prepare as C.I.69530 using 1(or 4)-amino-2-anthraquinonecarbonyl chloride as acylating agent

69540 C.I. Vat Orange 16 (Reddish orange)

Discoverer — Badische Co. 1911

Badische Co., BP 894/11; FP 425859; GP 237236, 237237, (*Fr.* 10, 708, 710), 256344, 268219, (*Fr.* 11, 597, 665), 279867 (*Fr.* 12, 445)

Schaarschmidt, GP 269800 (*Fr.* 11, 670)

FIAT 764 — Indanthrenorange F3R

Fierz-David, 601

Mayer, 208

References to method referred to in Note

Badische Co., GP 237546 (*Fr.* 10, 711)

Fierz-David, 600

Houben, 688

Thorpe, 1, 418

(a) Condense 1-chloro(or nitro)-2-anthraquinonecarboxylic acid with 2-aminoanthraquinone and cyclise

(b) Condense 2-bromo-1-anthraquinonecarbonitrile with 1-aminoanthraquinone in nitrobenzene and cyclise

Note — Some references give the following additional method of preparation giving a product containing a methyl group in position (X)

(c) Condense 1-chloro-2-anthraquinonecarboxylic acid with 5-amino-2-benzoyl-4-methylbenzoic acid and cyclise with sulfuric acid

H₂SO₄ conc. — yellowish orange; on dilution — orange ppt.
 Na₂S₂O₄, alkaline — dull violet; acid — reddish brown

69700 C.I. Vat Orange 21 (Yellowish orange)

Heat 2-methylantraquinone (or certain chloro-derivatives) with sulfur at higher temperatures. Treat the product with sodium hypochlorite with or without pretreatment with sulfuric acid

Discoverers — B. Mayer and A. Schaarschmidt 1908

Ciba, BP 7583/08, 20127/09; USP 899845, 902895; FP 398015; GP 209231, 209232, 211967, 213506, (*Fr.* 9, 810, 814, 811, 813), 223176 (*Fr.* 10, 747)

Bohn, *Ber.* 43 (1910), 1003

Schaarschmidt & Lewyeff, *J. prakt. Chem.* 113 (1926), 48

Fierz-David, *JSDC*, 51 (1935), 60

Shah, Tilak & Venkataraman, *Proc. Ind. Acad. Sci.* 30A

(1949), 1

Fierz-David, 617

Venkataraman, 1110

Insoluble in xylene

H₂SO₄ conc. — reddish brown; on dilution — brown ppt.

Na₂S₂O₄, alkaline — brown; acid — orange

69705 C.I. Vat Yellow 21 (Yellow)

Heat 2-(chloromethyl)anthraquinone (or its chloro-derivative) with sulfur at lower temperatures and treat the product with sodium hypochlorite

Note — Various structures have been postulated for this dye ¹

Discoverers — B. Mayer and A. Schaarschmidt 1908

Ciba, *BP* 7583/08; *USP* 899845, 902895; *FP* 398015; *GP* 209231, 209233, 211967, 213506, (*Fr.* 9, 810, 815, 811, 813)

Bayer Co., *GP* 175629 (*Fr.* 8, 359)

Fierz-David, *JSDC*, 51 (1935), 54, 60

Turner, *JSDC*, 63 (1947), 377

Fierz-David, 617 and Suppl. 95

¹Venkataraman, 1110

Slightly soluble in xylene

Insoluble in alcohol

H₂SO₄ conc. — dull reddish violet; on dilution — yellow ppt.

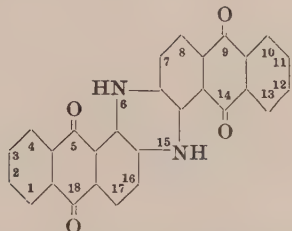
Na₂S₂O₄, alkaline — brown; acid — bright yellow

69800 C.I. Vat Blue 4 (Bright reddish blue)*

C.I. Food Blue 4

C.I. Pigment Blue 60 (Reddish blue)

Classical name **Indanthrone**



(a) Treat 2-aminoanthraquinone with potassium hydroxide in the presence of potassium nitrate, potassium chlorate, glucose or a salt of an organic acid such as potassium formate or acetate or a mixture of the two

(b) Treat 2-aminoanthraquinone with potassium hydroxide in the presence of ethyl alcohol and expose the mixture to air

(c) Condense 1-amino-2-bromoanthraquinone in the presence of copper chloride

(d) Reduce 8-nitro-1-anthraquinonesulfonic acid to 8-hydroxyl-amino-1-anthraquinonesulfonic acid. Convert to indanthronedisulfonic acid and desulfonate

Note — The dye may be prepared in a state of fine division by partial reduction with caustic soda and glucose followed by air oxidation or by precipitation from solution in sulfuric acid

* Purified brands—Redder

Discoverer — R. Bohn 1901

Badische Co., *BP* 3239/01, 12185/01, 22762/01, 24355/01, 19322/06, 14338/08, 17271/12, 20664/13; *USP* 682523, 724789, 739154, 746784, 855248, 1055701, 1150863; *FP* 309503, 372261, 392859; *GP* 129845, 129846, 129847, 129848, 135407, 135408, (*Fr.* 6, 412, 413, 413, 414, 415, 416), 139633, 141355, (*Fr.* 7, 227, 227), 186636, 186637, 210223, (*Fr.* 9, 777, 778, 848), 260428 (*Fr.* 11, 726), 287270 (*Fr.* 12, 431)

Bayer Co., *BP* 7692/04, 9102/06; *FP* 343608, 365305, 428990; *GP* 158287, 161923, 170562, 178130, (*Fr.* 8, 341, 344, 348, 346), 193121 (*Fr.* 9, 783), 239211 (*Fr.* 10, 697), 253240 (*Fr.* 11, 725)

M.L.B., *BP* 9269/14; *USP* 1145934; *FP* 470984; *GP* 290521 (*Fr.* 12, 479), 294830 (*Fr.* 13, 429)

Brit. Dye. Corp., *BP* 113489, 274226; *USP* 1767230; *GP* 481704 (*Fr.* 16, 1322)

Morton Sundour, *BP* 126112

Perkin, *BP* 126764

Scottish Dyes, *BP* 162687, 268537, 274156, 312404, 320359, 333146, 334902, 334921, 338891; *GP* 382178 (*Fr.* 14, 871)

Atack & Anderson, *BP* 166297

Kopetschni, *GP* 356922, 357767, (*Fr.* 14, 890, 891)

Du Pont, *BP* 271942, 470007; *USP* 1580700, 1640724; *FP* 612381

National Aniline, *USP* 1609965, 1692854

Ciba, *BP* 201540, 222624; *USP* 1568622

Agfa, *BP* 235556

I.G., *BP* 252392; *GP* 470809, 476811, 472772, 491430, (*Fr.* 16, 1316, 1317, 1319, 1321), 498292, 500178, 502458, 507345, 515096, (*Fr.* 17, 1214, 1215, 1215, 1216, 1217), 548832 (*Fr.* 16, 1144 and 17, 1106), 550779 (*Fr.* 17, 1218)

BIOS 987, 4, 52, 54; *FIAT* 1313, 2, 73

FIAT 764 — Indanthrenblau RS

Bohn, *Ber.* 36 (1903), 1258, 43 (1910), 999

Kaufler, *Ber.* 36 (1903), 930, 1721

Scholl, *Ber.* 36 (1903), 3410, 3710; 40 (1907), 933; 41 (1908), 2304

Scholl & Kačer, *Ber.* 36 (1903), 3416

Scholl & Berblinger, *Ber.* 36 (1903), 3427; 40 (1907), 395

Willstätter & Kalb, *Ber.* 37 (1904), 3763

Willstätter & Benz, *Ber.* 39 (1906), 3485

Scholl, Berblinger & Mansfeld, *Ber.* 40 (1907), 326

Scholl, Steinkoff & Kabazink, *Ber.* 40 (1907), 390

Scholl & Stegmüller, *Ber.* 40 (1907), 924

Holdermann & Scholl, *Ber.* 43 (1910), 340

Scholl, *Mhft. Chem.* 32 (1910), 1043

Scholl & Edlbacher, *Ber.* 44 (1911), 1727

Scholl & Eberle, *Mhft. Chem.* 32 (1912), 1035

Terres, *Ber.* 46 (1913), 1634

Schmidt, *Bull. Soc. ind. Mulhouse*, 84 (1914), 409

Rackowski, *Bull. Soc. ind. Mulhouse*, 90 (1924), 553

Brasz, *Z. angew. Chem.* 38 (1925), 853; *Chem. Zeitsch.* 52 (1928), 45, 62

Lulek, *JSDC*, 43 (1927), 370

Maki, *JSCI, Jap.* 32 (1929) Suppl. 300B, 303B; 33 (1930) Suppl.

456B, 461B; 34 (1931) Suppl. 250B, 253B; 36 (1933) Suppl.

44B, 199B; 37 (1934) Suppl. 744B

Tanaka, *JCS, Jap.* 56 (1935), 192

Fraser-Thomson, *JSDC*, 52 (1936), 239

Wittenberger, *Ost. Chem. Ztg.* 50 (1949), 58

Bradley & Leete, *JCS*, (1951), 2129

Bradley, Leete & Stephens, *JCS* (1951), 2166

Truttwin, 409

Barnett, 342

Thorpe, 1, 412

Venkataraman, 933

Purified brands

Badische Co., *BP* 184193; *USP* 1541156; *GP* 421206 (*Fr.* 14, 1494)

Scottish Dyes, *BP* 189834; *USP* 1518051

Du Pont, *USP* 1509846

I.G., *BP* 272924, 273299, 279401, 291851, 296106, 297042, 320397, 327087; *FP* 654686, 670562

Newport Chem. Col. Wks., *BP* 297692, 314803; *USP* 1634473

National Aniline, *USP* 1679230

FIAT 764 — Indanthrenbrillantblau R

Fierz-David, *Bull. Soc. chim.* 41 (1927), 1549

Bryans & Rowe, *JSCI*, 46 (1927), 335T

Köchlin & Silbermann, *Bull. Soc. ind. Mulhouse*, 95 (1929), 221

Scholl & Lamprecht, *Ber.* 63 (1930), 2126

Specially prepared physical forms

BIOS 987, 57; *FIAT* 1313, 3, 446

FIAT 764 — Indanthrenblau GGS, GGSNL, GGSNP

Slightly soluble in chloroform (hot), *o*-chlorophenol, quinoline

Insoluble in acetic acid, acetone, alcohol, pyridine, toluene, xylene

H₂SO₄ conc. — brown; on dilution — blue ppt.

Na₂S₂O₄, alkaline — blue; acid — reddish blue

69801 C.I. Solubilised Vat Blue 4 (Bright reddish blue)

Leuco sulfuric ester of C.I.69800

Prepare by method (c) — see C.I.59051A

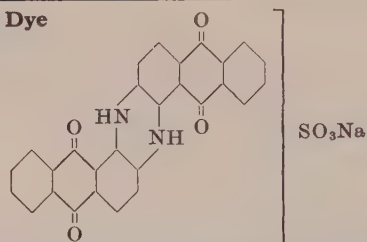
Discoverers and references —

General — see C.I.59051A

Additional — Dokunikhin, *Eighth Aniline Dye Conference (USSR)*, 121 (*JSDC*, 68 (1952), 468)

69805

Acid Dye



Sulfonate indanthrone with 100% sulfuric acid in the presence of boric acid and convert to the sodium salt

Discoverer — R. Bohn 1909

Indanthrene Blue WB (B)

Applied from a Glauber's salt-sulfuric acid bath
Fastness Properties: Light, good; Milling, good (C.I.1093
(1st Edn.) — unconfirmed)

Badische Co., BP 339/09; USP 948204; FP 409381; GP 216891
(Fr. 9, 782)

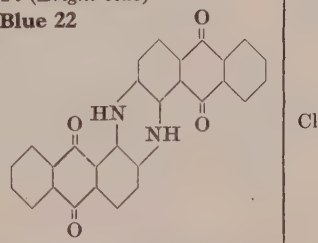
FIAT 764 — Indanthrenblau WBO

Soluble in alcohol (hot), water (hot)
H₂SO₄ conc. — dull yellow; on dilution — blue ppt.

69810

C.I. Vat Blue 14 (Bright blue)

C.I. Pigment Blue 22



Chlorinate indanthrone with sulfuryl chloride

Discoverer — R. Bohn 1903

Badische Co., BP 23179/03; GP 157449, 168042, (Fr. 8, 351, 352)

Brit. Dye. Corp., BP 271181

I.G., BP 331697

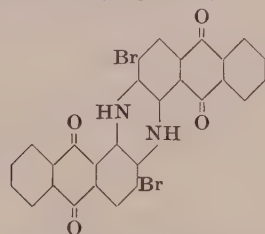
BIOS 987, 57; FIAT 1313, 2, 74, 79

FIAT 764 — Indanthrenblau GCD

Soluble in *o*-chlorophenol
Slightly soluble in chloroform, pyridine
Insoluble in acetone, alcohol, toluene
H₂SO₄ conc. — yellowish brown; on dilution — blue
Na₂S₂O₄, alkaline — blue; acid — reddish blue

69815

C.I. Vat Blue 11 (Bright blue)



- (a) Brominate indanthrone in sulfuric acid
(b) Condense 2-amino-1,3-dibromoanthraquinone in presence of cupric chloride

Insoluble in alcohol
H₂SO₄ conc. — dull yellowish brown; on dilution — blue ppt.
Na₂S₂O₄, alkaline — blue; acid — blue

Discoverers — R. Bohn 1902; M. Kugel 1903

Badische Co., BP 4035/02; USP 739579; FP 319018; GP 138167
(Fr. 7, 229)Bayer Co., BP 11717/03, 12757/05, 18196/05; USP 775369,
808762; GP 147872 (Fr. 7, 231), 158287, 158474, 167255,
172733, (Fr. 8, 341, 342, 343, 354)M.L.B., BP 9269/14; USP 1145934; FP 470984; GP Appln.
36323 (Fr. 12, 479)

Atack & Soutar, BP 185137

Brit. Dye. Corp., BP 271181

National Aniline, USP 1646235

I.G., BP 322277, 331697

Kaufler, Ber. 36 (1903), 931

Brown, JSDC, 22 (1906), 11

Scholl, Berblinger & Mansfeld, Ber. 40 (1907), 320

Ullmann & Junghans, Ann. 399 (1913), 341

Trutwin, 413

Barnett, 351

Fierz-David, 593

69816

Solubilised Vat Dye (Bright blue)

Tetra leuco sulfuric ester of C.I.69815

Prepare by method (c) — see C.I.59051A

Discoverer — O. Stallmann 1936

Du Pont, USP 2200480

BIOS 1088, 16; BIOS-MISC 20, App. 50

FIAT 764 — Anthrasolblau IGC

General References — See C.I.59051A

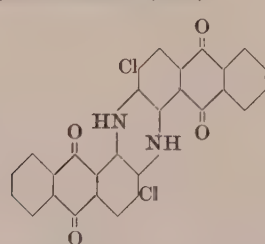
Anthrasol Blue IGC (IG)

Fastness Properties (C): Chlorine 3-4, Light 7-8, Soda boil 4

69825

C.I. Vat Blue 6 (Bright blue)

C.I. Pigment Blue 64 (Blue)



- (a) Chlorinate indanthrone by (1) action of fuming nitric and hydrochloric acids; (2) boiling with sulfuryl chloride or (3) action of benzoyl chloride, copper powder and nitrobenzene

(b) Condense phthalic anhydride with chlorobenzene, nitrate the chlorobenzoylbenzoic acid, reduce the nitro group, cyclise, brominate the 2-amino-3-chloroanthraquinone and condense the 2-amino-1-bromo-3-chloroanthraquinone in presence of a copper catalyst and an acid-binding agent

(c) Heat 2-amino-1,3-dichloroanthraquinone in the presence of an acid-binding agent and a cuprous halide

(d) Treat C.I.69815 with sulfuryl chloride in an inert solvent and decompose the complex so formed

Note — Process (b) gives a product possessing improved reducing and level-dyeing properties. It forms the leuco sulfuric acid ester more easily

Discoverer — R. Bohn 1903

Badische Co., BP 4035/02, 23179/03; USP 739579, 753659;
FP 319018; GP 138167, 155415, (Fr. 7, 229, 230), 157449
(Fr. 8, 351)Bayer Co., BP 11717/03; FP 332261; GP 147872 (Fr. 7, 231),
229166 (Fr. 10, 695)

M.L.B., GP 289279 (Fr. 12, 481)

Griesheim-Elektron, GP 296192 (Fr. 13, 426)

Atack & Soutar, BP 172682; USP 1452774

Cassella Co., BP 234962; USP 1509808

Scottish Dyes, BP 264916, 298248

I.G., BP 322277, 331697

Du Pont, USP 1862843, 1862844, 2126455, 2126456, 2205418,
2413483, 2413514

BIOS 987, 58; FIAT 1313, 2, 80

FIAT 764 — Indanthrenblau BC, BCS

Maki & Mine, JSCI, Jap. 47 (1944), 522 (CA, 42 (1948), 6119)

Smith & Reid, Chem. & Ind. (1948), 675

Rowe, RIC lectures, 85

Thorpe, 1, 415

Slightly soluble in chloroform (hot), *o*-chlorophenol, pyridine (hot)
Insoluble in acetone, alcohol, toluene
H₂SO₄ conc. — brown; on dilution — blue
Na₂S₂O₄, alkaline — greenish blue; acid — reddish blue

69826 C.I. Solubilised Vat Blue 6 (Bright blue)

Leuco sulfuric ester of C.I.69825

Prepare by method (c) — see C.I.59051A

Discoverers and references —

General — see C.I.59051A

Additional — FIAT 764 — Anthrasolblau IBC

The chlorinated indanthrones have been classified as simply as possible, but mixtures of derivatives, differing in degree of chlorination, appear as commercial dyes and complicate classification based on chemical constitution

Articles on the separation and classification, based on chemical constitution, appear in the following references —

Bedekar, Tilak & Venkataraman, *Proc. Ind. Acad. Sci.* **28A** (1948), 236
Thorpe, **1**, 414

69830 C.I. Vat Blue 10 (Bright blue)

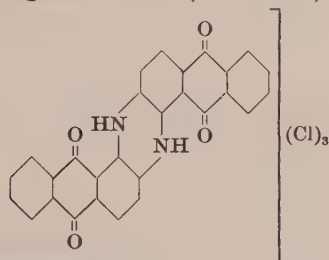
Mixture of mono-, di- and tri-chloro derivatives of indanthrone

The chlorine content varies from 1 atom to 3 atoms with an average of 2 atoms

Chlorinate indanthrone with chlorine gas in the presence of sulfuric acid and manganese dioxide

Note — The resistance to chlorine bleaching varies with the chlorine content

Discoverer — Badische Co. 1902

Badische Co., *GP* 138167, 155415, (*Fr.* **7**, 229, 230)I.G., *BP* 331697 H_2SO_4 conc. — olive brown $\text{Na}_2\text{S}_2\text{O}_4$, alkaline — greenish blue; acid — blue**69835 C.I. Pigment Blue 21 (Reddish blue)**

Chlorinate indanthrone

(a) In nitrobenzene with antimony pentachloride or with sulfuryl chloride

(b) In sulfuryl chloride, thionyl chloride or antimony pentachloride with excess chlorine

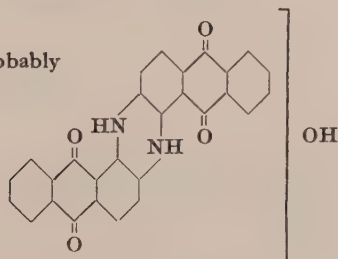
(c) In sulfuric acid in the presence of manganese dioxide with chlorine

Discoverer — Badische Co. 1905

Badische Co., *BP* 17242/05; *FP* 319018; *GP* 168042 (*Fr.* **8**, 352)
 M.L.B., *GP* 287590 (*Fr.* **12**, 480), 293971, 296841, 331283 (*Fr.* **13**, 432, 424, 425)

Griesheim-Elektron, *GP* 292127 (*Fr.* **13**, 426)Ciba, *BP* 113783; *USP* 1317160; *GP* 332381 (*Fr.* **13**, 427)Brit. Dye. Corp., *BP* 271181Scottish Dyes, *BP* 330217I.G., *BP* 331697Scholefield & Patel, *JSDC*, **45** (1929), 175 H_2SO_4 conc. — dull yellowish brown; on dilution — blue $\text{Na}_2\text{S}_2\text{O}_4$, alkaline — blue; acid — reddish blue**69840 C.I. Vat Blue 12 (Bright blue)**

Probably



OH

(a) Treat indanthrone with sulfuric acid in the presence of boric acid

(b) Treat C.I.69805 with sulfuric acid

Discoverer — R. Bohn 1909

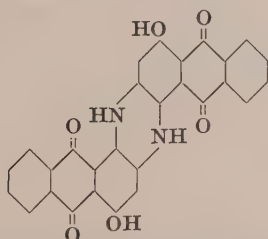
Badische Co., *BP* 339/09, 23875/09; *USP* 948204, 970878;
FP 409381; *GP* 216891 (*Fr.* **9**, 782), 227790 (*Fr.* **10**, 694)

Bayer Co., *BP* 11426/11; *FP* 429096; *GP* 240276 (*Fr.* **10**, 696)M.L.B., *BP* 240168; *FP* 603139BIOS 987, 56; *FIAT* 1313, 2, 79*FIAT* 764 — Indanthrenbrillantblau 3GFraser-Thomson, *JSDC*, **52** (1936), 240

Soluble in xylene

Slightly soluble in *o*-chlorophenol, glacial acetic acid

Insoluble in acetone, alcohol, chloroform, pyridine, toluene

 H_2SO_4 conc. — brownish olive; on dilution — blue ppt. $\text{Na}_2\text{S}_2\text{O}_4$, alkaline — blue; acid — bluish violet**69845 C.I. Vat Blue 13 (Bright greenish blue)**

Condense 1-amino-2-bromo-4-hydroxyanthraquinone in presence of copper or cupric chloride in an inert solvent (e.g. naphthalene)

Discoverer — P. Thomaschewski 1903

Bayer Co., *BP* 7692/04; *USP* 801418; *FP* 343608; *GP* 158287
 (*Fr.* **8**, 341), 193121 (*Fr.* **9**, 783)

BIOS 1493, 7

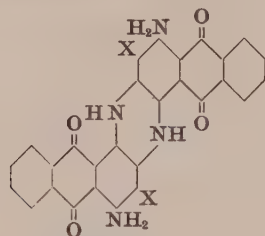
FIAT 764 — Indanthrenblau 5G

Barnett, 351

Fierz-David, 594

Slightly soluble in xylene (reddish violet)

 H_2SO_4 conc. — olive green; on dilution — bluish green ppt. $\text{Na}_2\text{S}_2\text{O}_4$, alkaline — dull olive; acid — bordeaux

69850 C.I. Vat Green 11 (Bluish green)

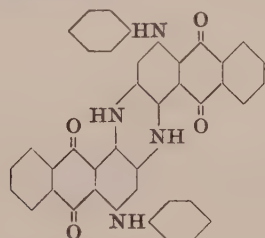
X = Br or Cl

Condense 1,4-diamino-2,3-dichloro(or dibromo)anthraquinone in presence of a copper catalyst and an acid-binding agent

Discoverer — M. Kugel 1903

Bayer Co., BP 7692/04, 5890/06, 10866/06; USP 775367; FP 343608, 366005; GP 158287, 178129, (Fr. 8, 341, 365), 193121 (Fr. 9, 783)
 Badische Co., BP 13057/06
 I.G., BP 331697
 BIOS 1493, 18
 FIAT 764 — Indanthrengruen BB
 Fraser-Thomson, JSDC, 52 (1936), 240
 Truttwin, 425
 Fierz-David, 594
 Houben, 718, 731

Insoluble in xylene
 H_2SO_4 conc. — green; on dilution — bluish green ppt.
 $\text{Na}_2\text{S}_2\text{O}_4$, alkaline — dull greenish blue; acid — dull blue

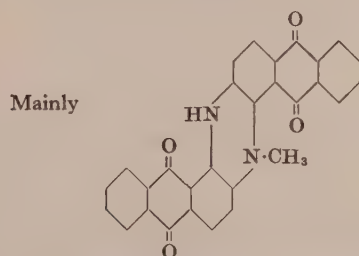
69855 C.I. Vat Green 6 (Dull green)

Condense 1-amino-4-anilino-2-bromoanthraquinone in presence of a copper catalyst and an acid-binding agent

Discoverer — M. Kugel 1903

Bayer Co., GP 158287 (Fr. 8, 341)
 Fraser-Thomson, JSDC, 52 (1936), 240
 Thorpe, 1, 415

H_2SO_4 conc. — bright green
 $\text{Na}_2\text{S}_2\text{O}_4$, alkaline — grey; acid — dull reddish grey

70000 Vat Dye (Reddish blue)

Condense 2-bromo-1-methylaminoanthraquinone in presence of cupric chloride and sodium acetate

Discoverer — M. Kugel 1903

Algol Blue K (By)

Application method A/Q3
 Fastness Properties (C): Chlorine 2, Light (as black) 8, Soda boil 4
 Bayer Co., BP 7692/04; USP 775368; FP 343608; GP 158287 (Fr. 8, 341), 193121 (Fr. 9, 783), 234294 (Fr. 10, 699)
 Badische Co., BP 17271/12; USP 1150863; GP 238979 (Fr. 10, 693), 260428 (Fr. 11, 726)
 BIOS 1157, 19
 FIAT 764 — Indanthrenblau RK
 Appleton & Geake, Trans. Far. Soc. 37 (1941), 60
 Bradley & Leete, JCS, (1951), 2129
 Müller, Text-Rund. 5 (1950), 306
 Barnett, 350
 Fierz-David, 594

Slightly soluble in xylene
 H_2SO_4 conc. — brownish olive; on dilution — blue ppt.
 $\text{Na}_2\text{S}_2\text{O}_4$, alkaline — brown

70005 C.I. Vat Blue 28 (Blue → Navy)

Condense indanthrone with paraformaldehyde

BIOS 987, 56; FIAT 1313, 2, 79

FIAT 764 — Indanthrenblau 3GF

$\text{Na}_2\text{S}_2\text{O}_4$, alkaline — blue; acid — violet

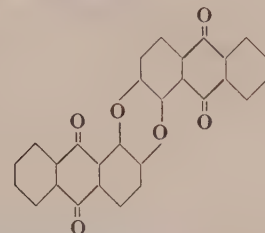
70010 C.I. Vat Blue 15 (Blue)

Treat C.I.69815 with formaldehyde

Discoverer — Badische Co. 1909

Badische Co., GP 159942 (Fr. 8, 350)
 FDX 885 (PB 74778) — Indanthrenblau 3GT

Slightly soluble in benzene, tetrahydronaphthalene, xylene
 Insoluble in alcohol
 H_2SO_4 conc. — yellowish khaki; on dilution — blue
 $\text{Na}_2\text{S}_2\text{O}_4$, alkaline — greenish blue; acid — bluish violet

70100 Vat Dye (Yellow)

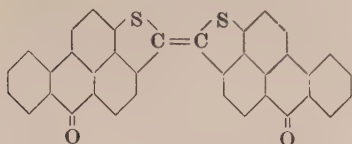
Heat 1-chloro-2-hydroxyanthraquinone with or without alkali. Purify by treatment with sodium hypochlorite

Discoverers — M. Iljinsky and R. Tschunke 1912

Erweco Yellow (RW)

Wedekind Co., BP 8503/03; USP 1087293; GP 152175 (Fr. 7, 167), 257832 (Fr. 11, 660)
 I.G., BP 386773; GP 561753, 570968, 572214, (Fr. 19, 2051, 2049, 2050)

Soluble in glacial acetic acid, nitrobenzene
 H_2SO_4 conc. — yellowish red; on dilution — yellow ppt.
 $\text{Na}_2\text{S}_2\text{O}_4$, alkaline — brownish red

70305 C.I. Vat Blue 7 (Dull greenish blue)

Condense 3-mercaptobenzanthrone with chloroacetic acid, fuse with caustic potash and oxidise

Note — Production by heating 4-methylbenzanthrone with sulfur, alone or preferably in presence of a diluent, has been claimed

Discoverers — B. Mayer and A. Pfannenstiehl 1908

Ciba, *BP* 20094/08, 11422/11, 15979/11; *USP* 1044797; *FP* 403025; *GP* 209351 (*Fr.* 9, 836), 243751 (*Fr.* 10, 684), 254098 (*Fr.* 11, 699)

Gen. Anil., *USP* 1778159

I.G., *GP* 483154 (*Fr.* 16, 1490)

BIOS 987, 6, 73

FIAT 764 — Indanthrenblaugruen FFB

Vlies, *JSDC*, 30 (1914), 30

Fierz-David, 618 and Suppl. 87

Insoluble in alcohol, pyridine, xylene

H₂SO₄ conc. — reddish black; on dilution — blue ppt.

Na₂S₂O₄, alkaline — bluish violet; acid — bluish red

70306 C.I. Solubilised Vat Blue 7 (Dull greenish blue)

Leuco sulfuric ester of **C.I.70305**

Prepare by general methods — see **C.I.59051A**

Discoverers and references —

General — see **C.I.59051A**

70310 Vat Dye (Green)

Oxidation product of **C.I.70305**

(a) Oxidise **C.I.70305** in presence of sulfuric acid

(b) Reflux 4-methylbenzanthrone with sodium polysulfide

Note — Further oxidation on the fibre by sodium hypochlorite turns the shade black

Discoverer — B. Mayer 1912

Cibanone Green B (Ciba)

Application method A/Q1

Fastness Properties (C): Chlorine 2, Light 7–8, Soda boil 5

Badische Co., *BP* 8295/11; *USP* 1054888; *FP* 434831; *GP* 242621 (*Fr.* 10, 685)

Ciba, *BP* 12228/13; *USP* 1097343; *FP* 458195; *GP* 261557, 265194, (*Fr.* 11, 701, 702)

Rowe, *RIC lectures*, 67

Slightly soluble in nitrobenzene

H₂SO₄ conc. — brown; on dilution — bluish green ppt.

Na₂S₂O₄, alkaline — violet; acid — violet

70311 Vat Dye (Dull green)

Oxidation product of **C.I.70305**

Oxidise **C.I.70305** in the presence of nitrobenzene

Discoverer — Ciba

Cibanone Olive B (Ciba)

Application method A/Q1

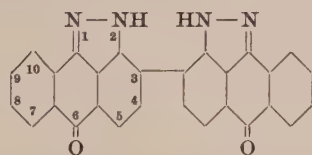
Fastness Properties (C): Chlorine 3, Light 8, Soda boil 5

Ciba, *GP* 265194 (*Fr.* 11, 702)

Slightly soluble in nitrobenzene (hot)

H₂SO₄ conc. — reddish brown; on dilution — brown ppt.

Na₂S₂O₄, alkaline — greenish blue

70315 Vat Dye

(a) Treat the anthrapyrazole, formed by the elimination of water from 1-hydrazinoanthraquinone, with alcoholic potassium hydroxide

(b) Treat 3-bromoanthrapyrazole with copper

Discoverer — A. Holl 1912

Pyrazolanthrone Yellow (GrE)

Griesheim-Elektron, *BP* 14103/15, 235919; *USP* 1595549; *FP* 451093; *GP* 255641 (*Fr.* 11, 583), 301554, 302259, 302260, (*Fr.* 13, 407, 410, 410)

Scottish Dyes, *BP* 297366

Bayer Co., *GP* 163447, 171293, (*Fr.* 8, 301, 304)

Gen. Anil., *USP* 1817995

I.G., *GP* 457182, 458538, (*Fr.* 16, 1371, 1371)

Möhlau, *Ber.* 45 (1912), 2233, 2244

Mayer & Heil, *Ber.* 55 (1922), 2155

Schwenk, *Chem. Ztg.* 52 (1928), 45, 62

Fraser-Thomson, *JSDC*, 52 (1936), 246

Kränzlein, *Ahrens' Samml.* 25 (1935), 26

Maki & Akamatsu, *JCS, Jap. (Ind. Chem. Sect.)*, 54 (1951), 326 (CA, 47 (1953), 2989)

Bradley & Geddes, *JCS*, (1952), 1636

Fierz-David, 622, Suppl. 103

Houben, 619, 735, 768

Mayer, 205

Thorpe, 1, 416

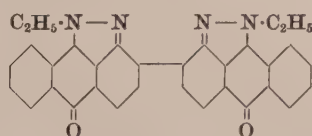
Soluble in aniline

H₂SO₄ conc. — yellowish red

Na₂S₂O₄, alkaline — greenish blue

70320 C.I. Vat Red 13 (Bluish red)

C.I. Pigment Red 195 (Bluish red)



Ethylate **C.I.70315**

Discoverers — F. Singer and A. Holl 1914

Griesheim-Elektron, *BP* 14103/15; *USP* 1329435; *GP* 301544, (*Fr.* 13, 407)

BIOS 987, 128; *FIAT* 1313, 2, 159

FIAT 764 — Indanthrenrubin R

Rowe, *JSDC*, 40 (1924), 370

Maki & Akamatsu, *JCS, Jap. (Ind. Chem. Sect.)*, 54 (1951), 326 (CA, 47 (1953), 2989); *Bull. Chem. Soc. Jap.* 26 (1952), 327 (*JSDC*, 70 (1954), 29)

Bradley & Geddes, *JCS*, (1952), 1636

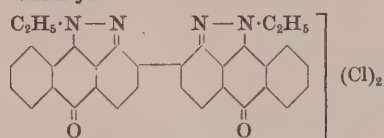
Thorpe, 1, 415

H₂SO₄ conc. — orange; on dilution — dark red ppt.

Na₂S₂O₄, alkaline — bluish green; acid — dull violet

70325

Vat Dye



Chlorinate C.I.70320

Discoverer — A. Holl 1924

Grelanon Red BD (GrE)

Griesheim-Elektron, GP 420191 (Fr. 15, 705)

70330

C.I. Vat Red 34 (Bluish red)

Probably an *N,N'*-bis(alkoxyalkyl) or *N,N'*-di-*sec*-alkyl derivative of C.I.70315

Koch, *Helv. Chim. Acta*, **24** (1941), 187EFox, *JSDC*, **65** (1949), 517 $\text{Na}_2\text{S}_2\text{O}_4$, alkaline — greenish blue; acid — violet

70331

C.I. Solubilised Vat Red 34 (Bluish red)

Leuco sulfuric ester of C.I. 70330

Prepare by general methods—see C.I. 59051A

Discoverers and references—

General—see C.I. 59051A

70335

Vat Dye

N-Monobenzyl derivative of C.I.70315

Discoverers — F. Singer and A. Holl 1914

Grelanon Scarlet G (GrE)

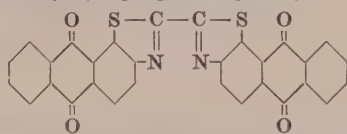
Griesheim-Elektron, GP 301554 (Fr. 13, 407), 359139 (Fr. 14, 886)

I.G., GP 458538

FDX 885 (PB 74719) — Grelanonscharlach G

70400

Vat Dye (Bright greenish yellow)



- (a) Treat 2-amino-1-mercaptoanthraquinone with glyoxal sulfate
(b) Heat anthraquinone-1,2(*N*)-thiazole with copper benzoate in naphthalene

Discoverers — A. Lüttringhaus and F. Kačer 1922

Algal Yellow 8G (IG)

Tendering of cellulose on exposure to light accelerated
Badische Co., BP 204249, 220216; USP 1544095; SwissP 108492,
110420; GP 421236 (Fr. 15, 689)

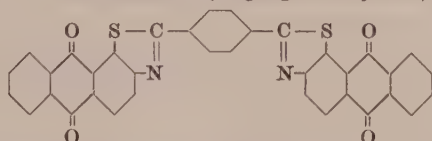
I.G., BP 478549

BIOS 987, 19; BIOS-MISC 55, 17; FIAT 1313, 2, 63

FIAT 764 — Algalgelb 8G

70405

C.I. Vat Yellow 11 (Bright greenish yellow)



- (a) Sulfurise the terephthaloyl derivative of 2-amino-1-chloro-anthraquinone

- (b) Treat 2-amino-1-mercaptoanthraquinone with terephthaloyl chloride

Discoverer — F. Kačer 1922

Badische Co., BP 204249, 242837; GP 384674 (Fr. 14, 885)

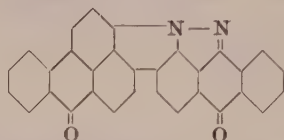
BIOS 987, 4

FIAT 764 — Algalgelb GGC

 $\text{Na}_2\text{S}_2\text{O}_4$, alkaline — violet; acid — reddish brown

70500

C.I. Vat Blue 25 (Reddish blue → Reddish navy)



Condense 3-bromobenzanthrone with anthrapyrazole and melt the product with alcoholic caustic potash

Discoverer — K. Wilke 1925

I.G., BP 298284; USP 1790780; GP 468896, 490723, (Fr. 16, 1454, 1368)

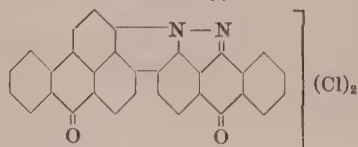
BIOS 1493, 26

FIAT 764 — Indanthrenmarineblau R

 H_2SO_4 conc. — bluish red $\text{Na}_2\text{S}_2\text{O}_4$, alkaline — greenish blue; acid — violet

70505

Vat Dye (Reddish navy)



Dichlorinate C.I.70500

Discoverer — K. Wilke 1926

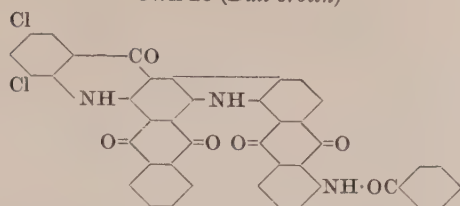
Indanthren Navy Blue RN (IG)

Application method A/Q1

Fastness Properties (C): Chlorine 4–5, Light 7–8, Soda boil 3–4

I.G., BP 298284; USP 1790780; GP 492274 (Fr. 16, 1374)

 $\text{Na}_2\text{S}_2\text{O}_4$, alkaline — bluish green; acid — reddish violet

70510 C.I. Vat Brown 26 (Dull brown)

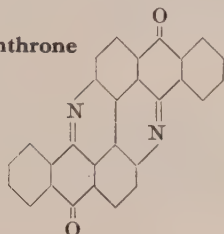
Condense 1-amino-5-benzamidoanthraquinone with 6,10,12-trichlorophthaloylacridone and cyclise

Discoverers — R. Berliner, W. Mieg, and F. Baumann 1926
I.G., *BP* 305082, 311283; *USP* 1804538, 1994033; *FP* 674639;
GP 465835 (*Fr.* 16, 1329), 509423, 509424, 513045, 513475,
(Fr. 17, 1402, 1405, 1236, 1403)
BIOS 1493, 11
FIAT 764; *FDX* 885 (*PB* 74778) — Indanthrenbraun 3GT
Kunz, Text-Rund. 6 (1951), 544

$\text{Na}_2\text{S}_2\text{O}_4$, alkaline — yellowish brown; acid — yellowish brown

70600 C.I. Vat Yellow 1 (Reddish yellow)

Classical name **Flavanthrone**



(a) Treat 2-aminoanthraquinone in nitrobenzene with antimony pentachloride or titanium tetrachloride

(b) Treat 2-aminoanthraquinone, in presence of an oxidising agent, with potassium hydroxide

(c) Convert 2,2'-biphenyldiamine into the diphtalimido derivative. Heat with aluminium chloride and cyclise with sulfuric acid

Discoverer — R. Bohn 1901

Badische Co., *BP* 24354/01, 14578/05; *USP* 739145, 828778;
FP 309503, 357239; *GP* 133686, 135407, 135408, 136015,
(Fr. 6, 417, 415, 416, 417), 138119, 139633, 139634, 139835,
 140573, 141355, 142963, (*Fr.* 7, 228, 227, 229, 232, 233, 227,
 233), 180157 (*Fr.* 8, 355), 184495, 215006, (*Fr.* 9, 794, 795)
M.L.B., *FP* 349376; *GP* 180069 (*Fr.* 8, 362)

Scottish Dyes, *BP* 207000, 260638, 271537, 274156, 274303,
 287039, 336983; *USP* 1490646, 1714249, 1779791; *GP* 512821
(Fr. 17, 1223), 560140 (*Fr.* 19, 2058)

Ullmann, *GP* 248999 (*Fr.* 11, 708)

Kopetschni, *GP* 363930 (*Fr.* 14, 850)

Brit. Dye. Corp., *BP* 249993; *FP* 608803

National Aniline, *USP* 1473061, 1492110

Du Pont, *BP* 272597; *USP* 1582328

I.G., *BP* 297133, 331842, 431790; *GP* 558474, 560237, 563079,
 564788, 574965, (*Fr.* 19, 2053, 2055, 2057, 2054, 2060), 597895,
 599914, (*Fr.* 21, 1103, 1106)

Cyanamid, *USP* 2468599

BIOS 987, 3, 46, 157; *BIOS-MISC* 55, 20; *FIAT* 1313, 2, 174

FIAT 764 — Indanthrenelb G

Scholl & Berblinger, *Ber.* 36 (1903), 3427

Brown, *JSDC*, 22 (1906), 11

Scholl, *Ber.* 40 (1907), 933, 1691; 41 (1908), 2304, 2328; *Ann.* 394
 (1912), 115

Scholl & Neovius, *Ber.* 41 (1908), 2534

Holdermann & Scholl, *Ber.* 43 (1910), 340

Scholl & Mansfeld, *Ber.* 43 (1910), 1738

Potschiwaushag, *Ber.* 43 (1910), 1748

Benesch, *Mhft. Chem.* 32 (1911), 447

Barnett, *JSDC*, 29 (1913), 189

Ullmann & Medenwald, *Ber.* 46 (1913), 1798

Scholl & Dischendorfer, *Ber.* 51 (1918), 452

Yoe & Edgar, *J. Phys. Chem.* 27 (1923), 65

Bryans & Rowe, *JSCI*, 46 (1927), 335T

Lulek, *JSDC*, 43 (1927), 370

Schwenk, *Chem. Ztg.* 52 (1928), 45

Kunz, *Bull. Soc. ind. Mulhouse*, No. 3 (1934); *Z. angew. Chem.* 52
 (1939), 269

Korolew & Rostowzowa, *Chem. Zent.* 2 (1935), 3162

Fraser-Thomson, *JSDC*, 52 (1936), 240

Maki & Yokote, *JSCI, Jap.* 39 (1936), Suppl. 441B, 442B

Beil. 24 (1936), 446, Suppl. 390

Barnett, 290, 300

Fierz-David, 609, Suppl. 89

Houben, 27, 32, 711, 714, 735, 745, 755

Thorpe, 1, 413

Venkataraman, 988

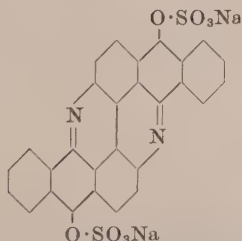
Soluble in nitrobenzene (hot)

Slightly soluble in *o*-chlorophenol, pyridine

Insoluble in acetone, alcohol, chloroform, toluene

H_2SO_4 conc. — dull orange; on dilution — yellow ppt.

$\text{Na}_2\text{S}_2\text{O}_4$, alkaline — blue; acid — green

70601 C.I. Solubilised Vat Yellow 1 (Reddish yellow)

Prepare by general methods — see **C.I.59051A**

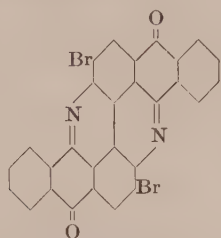
Discoverers and references —

General — see **C.I.59051A**

Additional — Scottish Dyes, *BP* 260638, 274303

70605

Vat Dye (Reddish yellow)



(a) Treat 2-amino-3-bromoanthraquinone with a solution of antimony pentachloride in nitrobenzene

(b) Fuse 2-amino-1,3-dibromoanthraquinone in the presence of cupric chloride with caustic alkali

Discoverer — M. Kugel 1904

Alizaranthrene Orange (BAC)

Fastness Properties: Chlorine, good; Light, good—very good (C.I.1119 (1st Edn.) — unconfirmed)

Bayer Co., BP 18196/05; USP 808762; FP 343608; GP 172733 (Fr. 8, 354)

Ullmann, BP 2949/12; FP 441245; GP 248999 (Fr. 11, 708)

Badische Co., GP 261270, 261271, (Fr. 11, 558, 559)

Newport Chem. Col. Wks., USP 1581111

Scholl & Stoll, Ber. 40 (1907), 1700

Ullmann & Junghans, Ann. 399 (1913), 344

Fierz-David, 610

Houben, 766

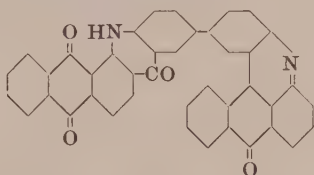
Soluble in nitrobenzene (hot), on cooling brown needles separate
Slightly soluble in tetrahydronaphthalene (warm), xylene (warm)
Insoluble in alcohol

H₂SO₄ conc. — orange (green fluorescence); on dilution — yellowish orange ppt.

Na₂S₂O₄, alkaline — reddish blue; acid — dull green

70695

C.I. Vat Brown 31 (Reddish brown)



Condense 2 mol. 1-nitro-2-anthraquinonecarboxylic acid with 1 mol. benzidine and cyclise in sulfuric acid; then decarboxylate

Note — In addition to the acridone/acridine dye illustrated, commercial dyes contain approximately 23% and 7% respectively of the corresponding diacridone and diacridine dyes

Discoverers — A. Lüttringhaus, O. Lohse and A. Sapper 1913

Badische Co., BP 28361/12; USP 1090636; FP 425859; GP 237236

(Fr. 10, 708)

BIOS 987, 5, 64; BIOS 1493, 43

FIAT 764 — Indanthrenrotbraun R

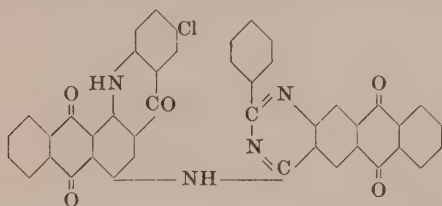
Soluble in tetrahydronaphthalene, xylene

H₂SO₄ conc. — brownish yellow; on dilution — reddish brown ppt.

Na₂S₂O₄, alkaline — reddish brown; acid — brown

70700

C.I. Vat Green 12 (Yellowish green)



Condense 3-amino-2-anthraquinonecarboxylic acid with benzoic acid and ammonia. Chlorinate with phosphorus pentachloride and condense with 6-amino-10-chlorophthaloylacridone

Discoverers — F. Baumann and W. Schwechten 1936

I.G., BP 476599, 494168; USP 2187812; GP 661152 (Fr. 25, 773)

BIOS 1493, 19; BIOS-MISC 55, 13

FIAT 764 — Indanthrengreen 4G

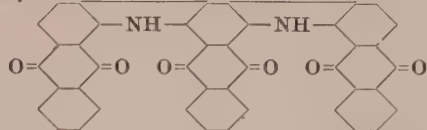
Venkataraman, 927

Na₂S₂O₄, alkaline — brown; acid — brownish olive

70800

C.I. Vat Brown 1 (Reddish brown)

Mainly



Condense 1,4-diaminoanthraquinone with 2 mol. 1-chloro(or bromo)anthraquinone and heat the product with aluminium chloride in pyridine

Discoverer — W. Mieg 1925

I.G., BP 297133; USP 1690236; GP 446932 (Fr. 15, 700), 451495

(Fr. 16, 1345), 507340 (Fr. 17, 1400)

FIAT 1313, 2, 101

FIAT 764 — Indanthrenbraun BR

Clibbens, JSDC, 59 (1943), 276

Maki & Kishi, JSCI, Jap. 45 (1942), 1205 (CA, 42 (1948), 6119)

Slightly soluble in tetrahydronaphthalene (hot), xylene (hot)

Insoluble in xylene (cold)

H₂SO₄ conc. — greenish grey; on dilution — brown ppt.

Na₂S₂O₄, alkaline — yellowish brown; acid — dull olive

70801

C.I. Solubilised Vat Brown 1 (Reddish brown)

Leuco sulfuric ester of C.I.70800

Prepare by general methods — see C.I.59051A

Discoverers and references —

General — see C.I.59051A

Additional —

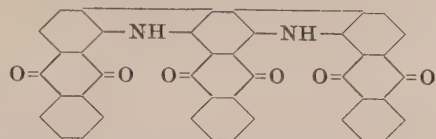
BIOS 960, 21

FIAT 764 — Anthrasolbraun IBR

¹ Dokunikhin, Eighth Aniline Dye Conference (USSR), 121 (JSDC, 68 (1952), 468)

70802 C.I. Vat Brown 44 (Reddish brown)*

Mainly



Condense 1,4-diaminoanthraquinone with 2 mol. 1-chloro(or bromo)anthraquinone and fuse the product with potassium hydroxide

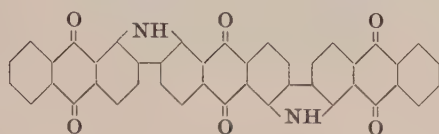
* *Yellower than C.I.70800*

Discoverer — R. Uhlenhut 1908

Bayer Co., *BP* 1822/08; *FP* 386599; *GP* 205195 (*Fr.* 9, 673)
M.L.B., *BP* 25551/08; *USP* 943717; *FP* 405920; *GP* 208969
(*Fr.* 9, 776), 240080 (*Fr.* 10, 639)
FIAT 764 — Indanthrenbraun GR
Maki & Kishi, *JSCI, Jap.* 45 (1942), 1205 (*CA*, 42 (1948), 6119)

Slightly soluble in tetrahydronaphthalene (hot), xylene (hot)
Insoluble in xylene (cold)

H₂SO₄ conc. — brown; on dilution — brown ppt.
Na₂S₂O₄, alkaline — reddish brown; acid — dull yellow

70805 C.I. Vat Orange 11 (Yellowish orange)

Condense 1,5-diaminoanthraquinone with 2 mol. 1-chloro(or bromo)anthraquinone. Cyclise the product with aluminium chloride or caustic potash and oxidise with potassium permanganate or sodium hypochlorite

Discoverers — E. Hepp, R. Uhlenhuth and F. Römer 1911

M.L.B., *BP* 23110/11, 238523; *USP* 1052480; *GP* 251021 (*Fr.* 11, 616), 430559 (*Fr.* 15, 704)
I.G., *BP* 296758; *GP* 507340 (*Fr.* 17, 1400)
BIOS 987, 121, 123, 124; *FIAT* 1313, 2, 181
FIAT 764 — Indanthren gelb 3R, 3RT
Fraser-Thomson, *JSDC*, 52 (1936), 243

Slightly soluble in *o*-chlorophenol, pyridine
Insoluble in acetone, alcohol, chloroform, toluene
H₂SO₄ conc. — reddish brown; on dilution — brownish

Na₂S₂O₄, alkaline — dull reddish brown; acid — dull yellow
yellow ppt.

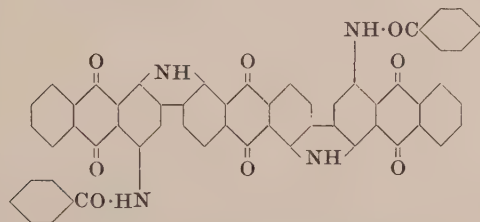
70806 C.I. Solubilised Vat Orange 11 (Yellowish orange)

Leuco sulfuric ester of C.I. 70805

Prepare by general methods—see C.I. 59051A

Discoverers and references—

General—see C.I. 59051A

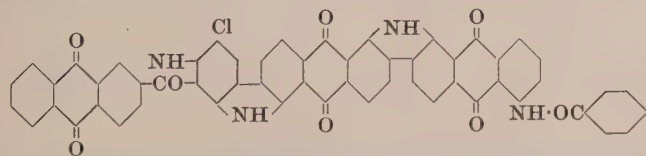
70810 C.I. Vat Brown 8 (Reddish brown)

Condense 2 mol. 1-benzamido-4-chloroanthraquinone with 1,5-diaminoanthraquinone and cyclise

Discoverers — F. Wieners and W. Mieg 1937

I.G., *BP* 519123; *USP* 2212965; *FP* 843525; *GP* 451495 (*Fr.* 16, 1345), 746546
BIOS 1493, 42
FIAT 764 — Indanthrenrotbraun GR
Fox, *JSDC*, 65 (1949), 513

Na₂S₂O₄, alkaline — wine red; acid — yellowish brown

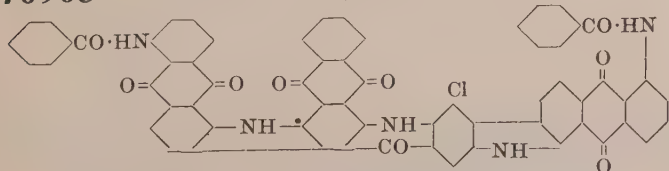
70900 Vat Dye

Condense 1,5-diaminoanthraquinone with 9,12-dichlorophthaloylacridone, then with 1-benzamido-5-chloroanthraquinone and cyclise

Discoverer — I.G.

Indanthren Brown NR (IG)

FDX 885 (*PB* 74778) — Indanthrenbraun NR

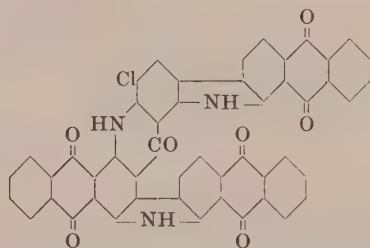
70905 C.I. Vat Brown 55 (Brown)

Condense 6-bromo-10,12-dichlorophthaloylacridone with 2 mol. 1-amino-5-benzamidoanthraquinone and cyclise

Discoverers — W. Bruck and W. Bauer 1937

I.G., *BP* 305082; *GP* 678499, 696425, (*Fr.-Bayer*, I-2, 382, 388)
BIOS 987, 164
Kunz, *Text-Rund.* 6 (1951), 543; *Melliand.* 33 (1952), 65

Na₂S₂O₄, alkaline — reddish brown; acid — yellowish brown

70910 C.I. Vat Brown 16 (Brownish olive)

Condense 6,7,9,12-tetrachlorophthaloylacridone with 2 mol. 1-aminoanthraquinone and cyclise with aluminium chloride

Discoverer — W. Bauer 1937

I.G., BP 496652; USP 2242446; FP 837481; GP 678499

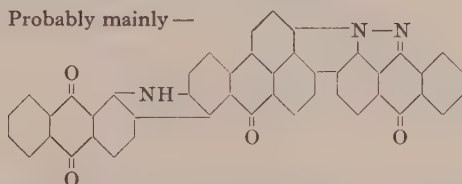
(Fr.-Bayer, I-2, 382)

BIOS 1088, 13; BIOS-MISC 20, App. 1

Na₂S₂O₄, alkaline — reddish brown; acid — yellowish brown

71000 C.I. Vat Black 8 (Bluish grey)

Probably mainly —



Condense together 3,9-dibromobenzanthrone, anthrapyrazole and 1-aminoanthraquinone in presence of caustic potash

Discoverers — K. Wilke, J. Stock, and Fr. Schubert 1929

I.G., BP 345728; USP 1943710; GP 520395 (Fr. 17, 1291)

BIOS 987, 110; FIAT 1313, 2, 109

FIAT 764 — Indanthrengrau M, MG

Maki, JSCI, Jap. 50 (1947), 140 (JSDC, 67 (1951), 36)

Slightly soluble in *o*-chlorophenol, pyridine

Insoluble in acetone, alcohol, chloroform, toluene

H₂SO₄ conc. — yellowish green

Na₂S₂O₄, alkaline — bluish green; acid — reddish brown

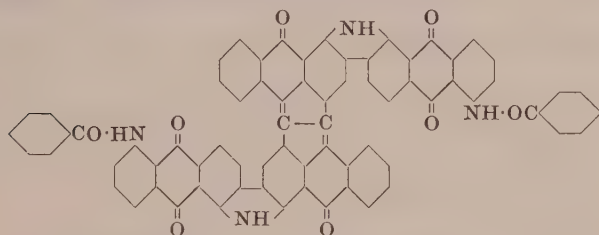
71001 C.I. Solubilised Vat Black 8 (Bluish grey)

Leuco sulfuric ester of C.I. 71000

Prepare by general methods—see C.I. 59051A

Discoverers and references—

General—see C.I. 59051A

71025 C.I. Vat Brown 9 (Dull yellowish brown → Brown)

Treat 1-chloroanthrone with glyoxal sulfate and condense the product with 2 mol. 1-amino-5-benzamidoanthraquinone and cyclise

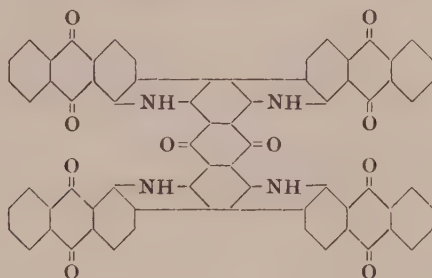
Discoverers — H. Scheyer and E. Schwamberger 1933

I.G., GP 550712 (Fr. 19, 2149), 576466, 589639, (Fr. 20, 1426, 1427), 611512 (Fr. 21, 1165)

FIAT 1313, 2, 104

FIAT 764 — Indanthrenbraun NG

Na₂S₂O₄, alkaline — reddish brown; acid — dark brown

71050 C.I. Vat Green 8 (Olive)

Condense 1-aminoanthraquinone with 1,4,5,8-tetrachloroanthraquinone in the presence of copper and nitrobenzene. Cyclise the pentanthrimide so formed with aluminium chloride

Discoverers — E. Hepp and Frobenius 1911

M.L.B., GP 262788 (Fr. 11, 618)

Du Pont, BP 439296; USP 2028103

BIOS 1493, 23; FIAT 1313, 2, 129

FIAT 764 — Indanthrenkhaki GG

Fraser-Thomson, JSDC, 52 (1936), 243

Thorpe, 1, 422

Venkataraman, 907

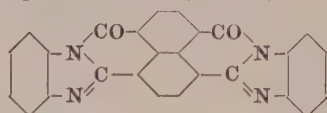
Insoluble in alcohol, organic solvents

H₂SO₄ conc. — dull brown; on dilution — olive green ppt.

Na₂S₂O₄, alkaline — brownish red; acid — olive

71100 C.I. Vat Red 15 (Dull red)

C.I. Pigment Red 194 (Dull red)



(a) Treat C.I.71110 with alcohol and caustic potash, filter, distil off alcohol and acidify

(b) Fractionally crystallise, from organic solvents, the hydrochlorides, sulfates or hydrobromides of C.I.71110, or the salts obtained by treatment of C.I.71110 with strong organic acids

(c) Treat C.I.71110 with aluminium chloride or zinc chloride, with or without a solvent, and fractionally crystallise the product

Discoverers — W. Eckert and H. Greune 1924

BIOS-MISC 20, App. 39; BIOS-MISC 55, App. 5

FIAT 1313, 2, 164, 168

Soluble in *o*-chlorophenol

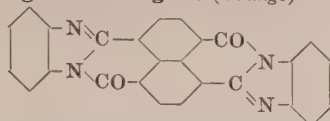
Slightly soluble in chloroform, pyridine, toluene

Insoluble in acetone, alcohol

H₂SO₄ conc. — reddish orange

Na₂S₂O₄, alkaline — brown (green fluorescence); acid — orange

71105 C.I. Vat Orange 7 (Reddish orange)
C.I. Pigment Orange 43 (Orange)

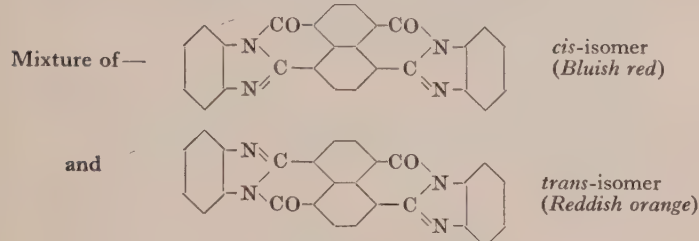


- (a) Heat **C.I.71110** with ethyl alcohol and caustic potash. Filter the addition product formed and hydrolyse with water
 (b) Treat **C.I.71110** with sulfuric acid
 Note — See also preparation of **C.I.71100**

Discoverers — W. Eckert and H. Greune 1924
 BIOS 987, 107; BIOS-MISC 55, App. 5; FIAT 1313, 2, 164, 168

Slightly soluble in *o*-chlorophenol, pyridine
 Insoluble in acetone, alcohol, chloroform, toluene
 H₂SO₄ conc. — dull reddish yellow
 Na₂S₂O₄, alkaline — olive (red fluorescence); acid — reddish brown

71110 C.I. Vat Red 14 (Dull yellowish red)



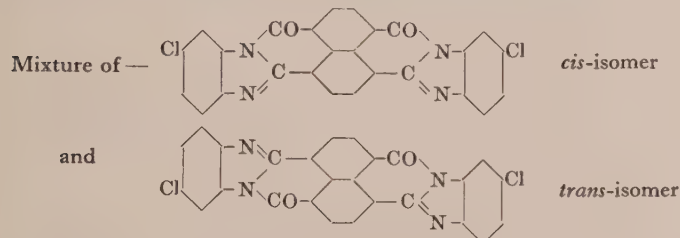
- (a) Heat a mixture of *o*-phenylenediamine and 1,4,5,8-naphthalene-tetracarboxylic acid in glacial acetic acid or pyridine solution. (When glacial acetic acid is used as solvent a larger proportion of the *trans*-isomer is obtained)
 (b) Heat 1,4,5,8-naphthalenetetracarboxylic acid with *o*-nitroaniline, reduce the nitro group and cyclise
 (c) Treat *N,N'*-diaryl-1,4,5,8-naphthalenetetracarboxylic diimides with 2 mol. *o*-phenylenediamine

Note — The *cis*- and *trans*- forms are present in approximately 40–45% and 60–55% respectively

Discoverers — W. Eckert and H. Greune 1924
 I.G., BP 237294, 265232, 265964, 313887, 341357, 353124, 364050, 366705, 369604, 391259, 403862, 434815, 447286, 480602; USP 1588451, 1888624, 1888625, 1888626, 1927928; GP 430632 (Fr. 15, 788), 456236, 457980, (Fr. 16, 1363, 1364), 536911, 538314, (Fr. 18, 1497, 1499), 567210 (Fr. 19, 2188)
 BIOS 987, 106; BIOS-MISC 55, 16, App. 6
 FIAT 1313, 2, 163, 168
 FIAT 764 — Indanthrenscharlach GG
 Fraser-Thomson, JSDC, 52 (1936), 245
 Gratschev, Prom. Org. Chem. 6 (1939), 620
 Fierz-David & Rossi, Helv. Chim. Acta, 21 (1938), 1466
 Thorpe, 1, 427

Soluble in *o*-chlorophenol
 Slightly soluble in chloroform (hot), pyridine
 Insoluble in acetone, alcohol, toluene
 H₂SO₄ conc. — yellowish brown
 Na₂S₂O₄, alkaline — olive; acid — blue (green fluorescence)

71115 C.I. Vat Brown 22 (Reddish brown)

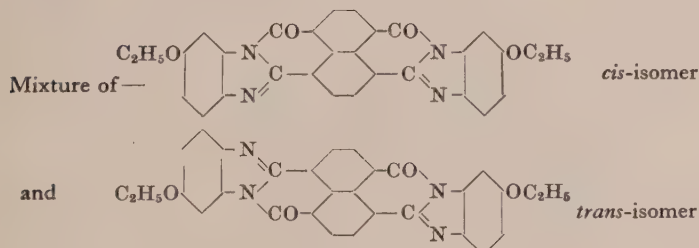


Condense 1,4,5,8-naphthalenetetracarboxylic acid with 4-chloro-*o*-phenylenediamine in glacial acetic acid or pyridine

Discoverers — W. Eckert and H. Greune 1924
 For patent references — see **C.I.71110**
 BIOS 1493, 37; BIOS-MISC 55, 16, App. 9
 FIAT 764 — Indanthrendruckbraun 5R

H₂SO₄ conc. — reddish yellow
 Na₂S₂O₄, alkaline — olive; acid — brown

71120 C.I. Vat Brown 14 (Reddish brown)



Condense 1,4,5,8-naphthalenetetracarboxylic acid with 4-ethoxy-*o*-phenylenediamine

Discoverers — W. Eckert and H. Greune 1924
 I.G., BP 237294; USP 1588451; GP 430632 (Fr. 15, 788)
 FIAT 764 — Indanthrendruckbraun B

Na₂S₂O₄, alkaline — olive; acid — reddish brown

71125 Vat Dye (Green)



- (a) Condense hydroxylamine with aceanthrenequinone; isomerise with sulfuric acid and fuse the resultant imide with potassium hydroxide
 (b) Treat aceanthrenequinone oxime with potassium hydroxide

Discoverer — M. Kardos 1913
Aceanthrene Green
 Kardos, BP 12584/13, 1425/14; FP 458949; GP 275220, 278660, 280839, 282711, 284210, 286096, (Fr. 12, 489, 490, 486, 486, 490, 491)
 Badische Co., GP 280092 (Fr. 12, 485)
 FIAT 764 — Aceanthrengruen
 Liebermann & Zsuffa, Ber. 44 (1911), 202, 852
 Kardos, Ber. 46 (1913), 2086
 Liebermann & Kardos, Ber. 47 (1914), 1203
 Maki & Hashimoto, JCS, Jap. (Ind. Chem. Sect.), 54 (1951), 479 (CA, 47 (1953), 5685)
 Barnett, 384
 Fierz-David, 622
 Mayer, 193

Na₂S₂O₄, alkaline — cherry red

71129 C.I. Pigment Brown 26 (Reddish brown)

Discoverer—M. Kardos 1913
GP 276357 (Fr. 12, 492)



3,4,9,10-Perylenetetracarboxylic diimide

71130 C.I. Vat Red 23 (Dull yellowish red)
C.I. Pigment Red 179 (Dull red)

Discoverer — M. Kardos 1913
Badische Co., BP 26690/13
Kardos, GP 276956 (Fr. 12, 493)
Kalle Co., BP 201786
FIAT 764 — Indanthrenrot 2G
Fraser-Thomson, JSDC, 52 (1936), 245
Rowe, RIC lectures, 95
Thorpe, 1, 427



- (a) Fuse *N*-methylnaphthalimide with caustic alkali
(b) Methylate 3,4,9,10-perylenetetracarboxylic diimide

Slightly soluble in tetrahydronaphthalene, xylene
H₂SO₄ conc. — violet; on dilution — brownish red ppt.
Na₂S₂O₄, alkaline — reddish violet; acid — dull orange

71135 C.I. Vat Red 32 (Red)
C.I. Pigment Red 189 (Red)

Discoverer — P. Friedländer 1919
Kalle Co., BP 201786; FP 555954; GP 386057 (Fr. 14, 484)
BIOS 1493, 3
FIAT 764 — Algolscharlach B

Condense 3,4,9,10-perylenetetracarboxylic acid with *p*-chloroaniline

H₂SO₄ conc. — violet; on dilution — red
Na₂S₂O₄, alkaline — reddish violet; acid — reddish orange

71140 C.I. Vat Red 29 (Red)
C.I. Pigment Red 190 (Red)

Discoverer — P. Friedländer 1919
Kalle Co., BP 201786; USP 1200848; FP 555954; SwissP 101760;
GP 386057 (Fr. 14, 484)
BIOS 1493, 50
FIAT 764 — Indanthrenscharlach R
Maki & Hashimoto, JCS, Jap. (Ind. Chem. Sect.), 54 (1951), 544
(CA, 47 (1953), 6143)

Condense 3,4,9,10-perylenetetracarboxylic acid with *p*-anisidine

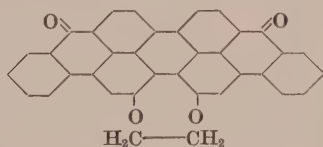
H₂SO₄ conc. — bright violet; on dilution — bright red ppt.
Na₂S₂O₄, alkaline — reddish violet; acid — dull reddish brown

71145 C.I. Pigment Red 123

Discoverers—T. Maki and S. Hashimoto 1951
JCS, Jap. (Ind. Chem. Sect.) 54 (1951), 544; CA 47 (1953), 6143

**71200 C.I. Vat Blue 16 (Navy)**

Discoverers — A. H. Davies and R. F. Thomson 1921
Scottish Dyes, BP 193431, 230600; USP 1531261; SwissP
104710; GP 417068 (Fr. 15, 760)
I.G., BP 273247; FP 543910; GP 451122 (Fr. 15, 769)
Du Pont, BP 546997; USP 2318266
BIOS 987, 70; FIAT 1313, 2, 134
FIAT 764 — Indanthrenmarineblau G
Maki, JSCI, Jap. 46 (1943), 1256
Thorpe, 1, 425



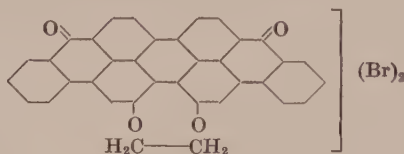
Note — The dimeric formula postulated for this dye is believed to be incorrect

Etherify 16,17-dihydroxyviolanthrone with ethylene dibromide or 2-chloroethyl *p*-toluenesulfonate in presence of trichlorobenzene

Soluble in xylene (bluish violet)
H₂SO₄ conc. — red
Na₂S₂O₄, alkaline — blue; acid — bordeaux

71205 C.I. Vat Blue 53 (Greenish blue)

Discoverers — M. A. Kunz and K. Köberle 1928
I.G., BP 325525; USP 1791215; GP 499169, 510600, (Fr. 17,
1334, 1336)
FIAT 1313, 3, 95
FDX 885 (PB 74778) — Indanthrenblaugrün 3B



Dibrominate C.I.71200 in chlorosulfonic acid

Note — This product contains varying amounts of chlorine in the molecule

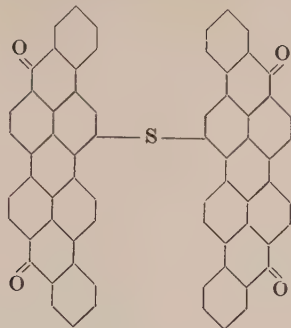
71210

Vat Dye (Black)

Discoverers — P. Nawiasky and E. Krauch 1924**Indanthren Printing Black BB (IG)**I.G., GP 411693, 423878, (*Fr.* 15, 756, 757)

FDX 885 (PB 74778) — Indanthrendruckschwarz Neu & BB

Possibly



Treat nitrated violanthrone with sulfur

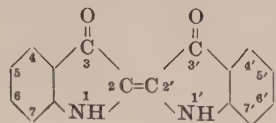
NOTES

NOTES

INDIGOID COLOURING MATTERS

The chromophore of this class is the grouping $\text{--}\overset{\text{O}}{\parallel}\text{C--}\overset{\text{O}}{\parallel}\text{C=C--}\overset{\text{O}}{\parallel}\text{C--}$ The dyes contain NH groups or S atoms as auxo-

chromes, e.g.

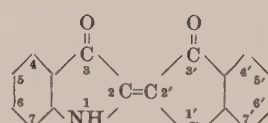


Indigo (C.I.73000)



Thioindigo Red B (C.I.73300)

and



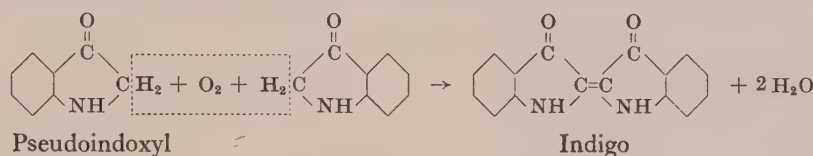
Ciba Violet A (Intermediate for C.I.73610)

The system of numbering is as shown above.

Indigoid colouring matters may be symmetrical or unsymmetrical, depending upon whether the two parts of the molecule united by the double bond are identical or different in structure or orientation. Symmetrical dyes are obtained by the oxidative

coupling of two molecules of compounds such as pseudoindoxyl,

For example Indigo is prepared by the union of two molecules of pseudoindoxyl in the presence of oxygen



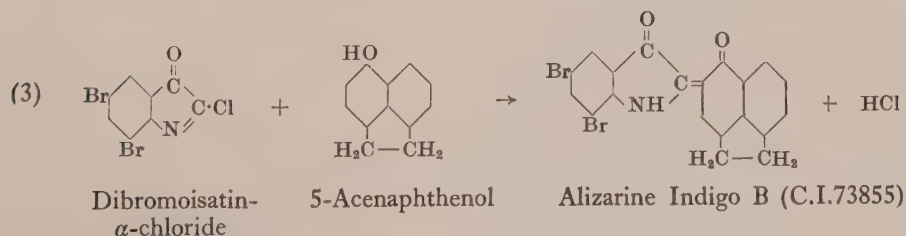
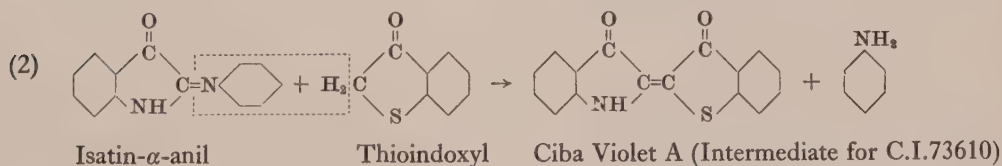
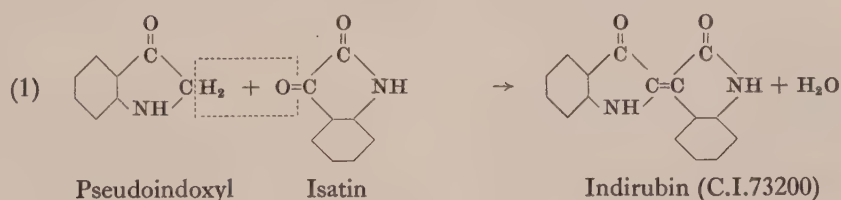
The *symmetrical* dyes have the constitution $\text{Ar}\overset{\text{O}}{\parallel}\text{C}=\text{C}\overset{\text{O}}{\parallel}\text{Ar}$ where X represents a divalent atom or group such as S, NH, NR.

Unsymmetrical dyes result when a compound such as pseudoindoxyl or thioindoxyl is condensed with a cyclic ketone such as isatin,

as isatin- α -anil (2-(phenylimino)pseudoindoxyl) or by the reaction of dibromo-

isatin- α -chloride (5,7-dibromo-2-chloro-3-pseudoindolone) with a phenolic compound.

These reactions may be illustrated by the following examples —



which are typical of the molecular patterns to which most indigoid dyes conform.

Indigo and thioindigo dyes can exist in both *cis* and *trans* forms, the latter being the more stable form which predominates in the solid state as reported in the following references — von Alphen, *Ber.* **72B** (1939), 525; Brode & Wyman, *J. Research Nat. Bureau of Standards*, **47** (1951), 170; Brode & Wyman, *JACS*, **73** (1951), 1487, 4267.

The dyes have been classified as follows —

- (a) Indigo and its derivatives and homologues (Nitrogen compounds) (C.I.73000–73215)
- (b) Thioindigo and its derivatives and homologues (Sulfur compounds) (C.I.73300–73425)
- (c) Indole-Thianaphthene dyes (Nitrogen-Sulfur compounds) (C.I.73595–73685)
- (d) Miscellaneous dyes (C.I.73800–73870)

The introduction of Cl, Br, NH₂, CH₃, OCH₃, etc., as substituents gives rise to numerous derivatives of Indigo and its analogues. Those with nitrogen only as auxochromes are generally limited in hue to reddish or greenish blues whereas those with sulfur, alone or with nitrogen, cover almost the whole range of the spectrum.

The Indigoid colouring matters and the sulfuric esters of their leuco compounds are used for the dyeing and printing of cellulosic and animal fibres. Indigo becomes soluble in water when sulfonated and may then be applied as an acid dye but such dyeings possess poor fastness to light, washing, etc.

The salts of the sulfuric esters of the leuco indigoid dyes, i.e. the solubilised vat dyes, are listed immediately after the parent dyes.

References

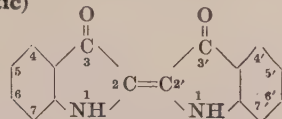
- Truttwin, *Encyclopädie der Küpenfarbstoffe* (1920)
Thorpe, *Synthetic Colouring Matters; Vat Colours* (1923)
Martinet, J., *L'Indigo et ses Dérivés* (1926); *Les Indigoïdes* (1934)
Reis and Schneider, *Z. Krist.* **68** (1928), 543
Heller, *Ber.* **72** (1939), 1858
Venkataraman, *Synthetic Dyes*, Vol. II (1952), Chap. 33
Brode, W. R., Pearson, E. G., and Wyman, G. M., *JACS*, **76** (1954), 1034
Lubs, *The Chemistry of Synthetic Dyes and Pigments* (1955), Chap. 8
Ullmann, *Encyclopädie der technischen Chemie*, **8** (1957), 748–763
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INDIGOID COLOURING MATTERS

(a) Indigo and its derivatives and homologues (Nitrogen compounds)

73000 C.I. Vat Blue 1 (Navy → Reddish navy)
C.I. Pigment Blue 66 (Blue)

Classical name **Indigo** (synthetic)



(a) Convert *N*-phenylglycine into pseudindoxyl by fusion with sodium amide (or sodium and a current of ammonia) in presence of a mixture of potassium and sodium hydroxides and sodium cyanide. Oxidise the pseudindoxyl with air

(b) Convert phenylglycine-*o*-carboxylic acid (*N*-(carboxymethyl)-anthranilic acid) into indoxyl acid by fusion with alkalis, and follow by air oxidation in alkaline solution

(c) Treat thiocarbamilide with potassium cyanide and lead carbonate in aqueous-alcoholic solution, and convert the α -cyano-*N,N'*-diphenylformamidine formed into 2-anilino- α -(phenylimino)thioacetamide by the action of yellow ammonium sulfide, thence into 2-(phenylimino)-pseudindoxyl (isatin- α -anilide) by heating with conc. H_2SO_4 , isolate as the hydrochloride (or bisulfite compound), and convert directly to indigo by treatment with ammonium sulfide; 2-thioisatin is an intermediate reaction product which is not isolated (Sandmeyer)

This method is mainly of importance for the preparation of isatin which can be obtained by hydrolysing the 2-(phenylimino)pseudindoxyl with 25% sulfuric acid at the boil (GP 119280)

(d) React *o*-nitrobenzaldehyde with acetone in the presence of sodium hydroxide

(e) Convert (*o*-nitrophenyl)propionic acid into isatin by heating with sodium hydroxide followed by reduction with glucose

Note — (1) For information on naturally occurring indigo, see **C.I.75780**

(2) Indigo exists in both *cis* and *trans* forms, the latter predominating in the solid state

- Baeyer & Emmerling, *Ber.* **3** (1870), 514
 Levinstein, *JSDC*, **17** (1901), 138
 Sandmeyer, *Z. Farb. u. Textilchem.* **2** (1903), 129
 Michel, *Chem. Ztg.* **35** (1911), 755
 Fechter, *Chem. Ztg.* **38** (1914), 273
 Friedländer & Risse, *Ber.* **47** (1914), 919
 Robinson, *JSDC*, **37** (1921), 77
 Madelung & Wilhelm, *Z. angew. Chem.* **34** (1921), 482, 486
 Kunz et al., *Ber.* **55** (1922), 3668; **56** (1923), 2027; **58** (1925), 1860, 60 (1927), 367
 Heller, *Chem. Zent.* **1** (1923), 422
 Pirschle, *Biochem. Z.* **136** (1923), 403
 Posner & Pyl, *Ber.* **56** (1923), 31
 Posner & Heumann, *Ber.* **56** (1923), 1671
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 Hansen, *Ann. de chim.* **1**, 94; *Chem. Zent.* **2** (1924), 2698
 King, *JSCI*, **44** (1925), 135, 285
 Lowry, *JSCI*, **44** (1925), 230
 English & Calcott, *Ind. Eng. Chem.* **17** (1925), 300
 Martinet, *Chim. et Ind.* **13** (1925), 531
 Calvin & Overmeyer, *JACS*, **48** (1926), 454
 Posner & Hofmeister, *Ber.* **59** (1926), 1827
 Watson & Penning, *Ind. Eng. Chem.* **18** (1926), 1309
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 Tanasescu & Georgescu, *Bull. Soc. chim.* **51** (1932), 234
 Kuhn, *Naturwiss.* **126** (1932), 611
 Heller, *Ber.* **72** (1939), 1858
 van Alphen, *Rec. Trav. chim.* **58** (1939), 378; **59** (1940), 219; **60** (1941), 138
 de Diesbach, Jacobi & Taddei, *Helv. Chim. Acta*, **23** (1940), 469
 H. B. Bradley & Derrett-Smith, *JSDC*, **56** (1940), 97
 W. Bradley, *JSDC*, **57** (1941), 9
 à Brassard, *JSDC*, **59** (1943), 127
 Gill & Stonehill, *JSDC*, **60** (1944), 183
 Hodgson, *JSDC*, **62** (1946), 176
 Knott, *JSDC*, **67** (1951), 302; *JCS* (1947), 1196
 Truttwin, 63–70
 Martinet, L'Indigo et ses Dérivés

Insoluble in ethanol
 Soluble in aniline (hot)
 H_2SO_4 conc. — yellowish green; on dilution — blue ppt.
 HNO_3 conc. — reddish yellow due to formation of isatin
 $Na_2S_2O_4$, alkaline — yellow; acid — colourless

Discoverers — Heumann (Prep. a and b) 1890
 Pfleger (use of sodium amide in Prep. a) 1901
 Sandmeyer (Prep. c) 1899
 Baeyer and Drewsen (Prep. d) 1882
 Baeyer (Prep. e) 1880

Patents with respect to (a)

- Badische Co., BP 8726/90, 16420/01, 5564/05; USP 622139, 657652, 718340, 746965, 818341, 891708; FP 20656, 313872, 352311; GP 54626 (Fr. 2, 100), 63310 (Fr. 3, 279), 132621 (Fr. 6, 534), 169358, 177491, 179933, (Fr. 8, 389, 390, 413), 188436, 212845, (Fr. 9, 514, 513)
 M.L.B., BP 22733/01, 26061/01, 11630/03, 18131/03; USP 714000; FP 315940, 317121, 338824; GP 120900, 135332, (Fr. 6, 561, 536), 149637 (Fr. 7, 271), 163039, 166213, 166214, (Fr. 8, 404, 406, 407)
 Gold & Silber-Scheide-Anst., BP 13059/01, 16875/01, 16012/05; USP 680395, 704804; FP 312763 and addn. of 22/8/01, 356569; GP 137955, 141749, (Fr. 6, 567, 1316), 142700 (Fr. 7, 265), 180394 (Fr. 8, 408)
 Basle Chem. Works, BP 18127/02; USP 727270; GP 145376 (Fr. 7, 253), 165691 (Fr. 8, 415)
 Chem. Fabr. Heyden, GP 120321 (Fr. 6, 252), 158089 (Fr. 8, 420)
 Lippmann, GP 163515 (Fr. 8, 387)
 Lilienfeld, BP 10925/04; FP 343078; GP 166477, 179759, 189099, (Fr. 8, 417, 418, 1787)
 Wohl und Blanck, GP 167698 (Fr. 8, 388)
 Griesheim-Elektron, BP 3980/11; USP 1011500; FP 426123; GP 244603 (Fr. 10, 335)
 Weiler-ter-Meer, GP 244825 (Fr. 10, 334)
 Dow Chem. Co., USP 1211413, 1564218
 Bourcart, USP 1293680
 Brit. Dye. Corp. BP 188933; GP ap. B96969, B106743, (Fr. 14, 904, 904)

Patents with respect to (b)

- Badische Co., BP 10509/90, 9291/94, 13533/99, 21821/00, 6419/03, 14676/03; USP 534560, 546165, 690325, 731385, 765576; FP 206982 with addns. 12/11/94 and 27/4/95, 284075, 290482, 338458, 338902, 350909, 776095; GP 56273 (Fr. 3, 281), 85494, 85671, (Fr. 4, 1032, 1032), 111067, 121287, 127178, 127577, (Fr. 6, 537, 540, 538, 542), 14934, 152548, 157710, 157840, 157909, 157910, (Fr. 7, 258, 267, 780, 779, 777, 779), 158346 (Fr. 8, 396)
 Leonhardt Co., BP 5763/00; USP 662754, 662755; FP 300287; GP 117924, 120105, 120138, (Fr. 6, 527, 530, 532)
 M.L.B., BP 21731/00, 22758/00, 1326/03; USP 675217; FP 306302 and addns. of 12/7/02 and 19/1/03; GP 125456 (Fr. 6, 540), 142506, 142507, 143902, (Fr. 7, 261, 262, 262)
 Bayer Co., GP 138177 (Fr. 6, 566)
 Kalle Co., GP 206903 (Fr. 9, 516)
 Michel, GP 232986 (Fr. 10, 345)
 von Heyden, BP 3730/00; FP 289621

Patents with respect to (c)

- Geigy, BP 15416/99, 15497/99, 6036/00, 6878/01; USP 647279, 647280, 647281, 697545; FP 279393, 279418, 291339, 291416 and addns., 309768; GP 113848, 113978, 113979, 113980, 113981, 115169, 115464, 115465, 115653, 119280, 119831, 123887, 125916, 131934, (Fr. 6, 573, 675, 583, 578, 579, 574, 577, 580, 575, 583, 584, 582, 582, 585)
 Rahtjen, BP 1596/06, 13499/08; USP 937194; FP 365109, 393085; GP 175423 (Fr. 8, 425), 204478 (Fr. 9, 520)
 Bayer Co., GP 277396 (Fr. 12, 258)

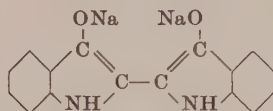
Patents with respect to (d)

- Badische Co., BP 1266/82; USP 257812, 257813, 257814, 257815; FP 146714, 150750; GP 19768 (Fr. 1, 140)

Patents with respect to (e)

- Badische Co., BP 1171/80, 1177/80, 466/81; USP 227470, 228300, 233458, 233459, 233460, 235193, 240359, 240360, 250036, 250037; FP 135742 and 3 addns.; GP 11857, 11858, 12601, 14997, 15516, 17656, (Fr. 1, 127, 131, 131, 132, 133, 134)

- BIOŚ 1482, 18; FIAT 1313, 2, 289
 FIAT 764 — Indigoreinblau
 von Baeyer, *Ber.* **3** (1870), 514
 Schützenberger, *Compt. rend.* **85** (1877), 147
 von Baeyer, *Ber.* **11** (1878), 1228; **13** (1880), 2254; **14** (1881), 1741; **16** (1883), 2204
 Sommaruga, *Ann.* **195** (1879), 302
 Heumann, *Ber.* **23** (1890), 3043, 3431
 O'Neill, *Chem. News*, **65** (1892), 124

73001 C.I. Reduced Vat Blue 1 (Navy → Reddish navy)Classical name **Indigo White**

Reduce indigo in presence of alkalis, with or without the addition of various stabilising agents

I.G., *BP* 240459, 248811; *FP* 589914, 610901; *Sw.P* 114285, 116746, 120799; *GP* 427997, 440827, 441101, 445919, (*Fr.* 15, 629, 630, 630, 631)

BIOS 1482, 21; *FIAT* 1313, 2, 289

FIAT 764 — Indigoweiss

Chevreur, *Ann. Chim. Phys.* 66 (1808), 30

Gilbert's Ann. 25, 451

Baeyer, *Ber.* 15 (1882), 54

Liebermann & Dickhuth, *Ber.* 24 (1891), 4130

Mullerus, *Chem. Ztg.* 17 (1893), 1454

Goppelsröder, *Chem. Ztg.* 17 (1893), 1633

Binz, *Z. Elektrochem.* 5 (1898), 5

Vorländer & Drescher, *Ber.* 34 (1901), 1858

Grandmougin, *J. prakt. chem.* 76 (1907), 142

Madelung, *Ber.* 57 (1924), 241

Nevgas & Löwy, *Trans. Amer. Electr. Soc.* (1926), 50; *Chem. Zent.* 1 (1927), 603

Binz & Prouge, *Z. angew. chem.* 40 (1927), 1474

Soluble in ethanol (blue fluorescence)

NaOH — yellowish green

Na₂S₂O₄, alkaline — yellow; acid — colourless

Discoverers — Proust 1805

Chevreur 1808

A. Schmidt (Stable Indigo White) 1904

Patents for Indigo White

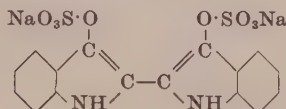
Badische Co., *BP* 23396/99, 6226/04, 25889/04, 12444/05, 1954/07; *USP* 657307, 657320, 794049, 820900; *FP* 294183, 294717, 320259, 348360, 348366 addn. of 5/7/05; *GP* 120318, 121866, (*Fr.* 6, 593, 594), 137884 (*Fr.* 7, 299), 164509, 165429, 166835, 168395, 171785, (*Fr.* 8, 452, 454, 453, 445, 455)
M.L.B., *BP* 5277/02; *USP* 723007; *FP* 319390; *GP* 139567 (*Fr.* 7, 299), 174127 (*Fr.* 8, 455)
Opladen, *BP* 2009/01, 10833/01; *USP* 671994; *FP* 307768, 311305; *GP* 131118, 131245, (*Fr.* 6, 599, 600)

Patents for Stable Indigo White

Badische Co., *BP* 11141/08, 30197/09; *USP* 910889; *FP* 360447 addn. of 14/3/07, 390455, 396794 and addn. of 23/7/09; *GP* 197391, 197870, 204568, 213472, (*Fr.* 9, 621, 620, 621, 623), 227319, 235047, (*Fr.* 10, 426, 427), 248837 (*Fr.* 11, 334), 285322 (*Fr.* 12, 281)
M.L.B., *BP* 17437/11, 17450/11, 13673/12, 13675/12; *USP* 906307, 1005481, 1054039, 1096060, 1239526; *FP* 430634 addns. of 24/7/11 and 25/7/11, 444120; *GP* 174127, 192872, (*Fr.* 8, 448, 1366), 200914 (*Fr.* 9, 619), 241802, 244738, (*Fr.* 10, 413, 414), 248992 (*Fr.* 9, 321), 254067, 257457, 262833, 265832, (*Fr.* 11, 332, 328, 328, 329), 280370, 290597, (*Fr.* 12, 282, 283), 354946, 356411, 357680, 407474, 408177, (*Fr.* 14, 933, 934, 935, 937, 939)
Holtschmidt, *GP* 231325, 239834, (*Fr.* 10, 418, 420)
Heyden Co., *GP* 245623, 245624, (*Fr.* 10, 430, 432), 248836 (*Fr.* 11, 335)
Wedekind Co., *USP* 1175634; *GP* 275121 (*Fr.* 11, 337)
Cassella Co., *GP* 321119 (*Fr.* 13, 462)
Brochet, *USP* 1247927; *GP* 325562 (*Fr.* 13, 460)
Bennert, *GP* 358860 (*Fr.* 14, 939)

73002 C.I. Solubilised Vat Blue 1 (Navy → Reddish navy)

Leuco sulfuric ester of **C.I.73000**



Prepare by general method — see C.I.59051A

Discoverers — Bader and Sunder 1921

General — see C.I.59051A

Additional — *FIAT* 764 — Anthrasol O, Indigosol O

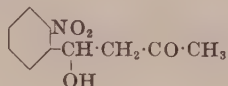
Soluble in water, ethanol

NaOH — unaltered

H₂SO₄ conc. — bluish green

73005 Vat Dye (Navy)

Bisulfite compound of



viz. C₁₀H₁₁NO₄ + NaHSO₃ + 3H₂O

(a) React *o*-nitrobenzaldehyde with acetone in aqueous sodium hydroxide. Convert the product into the bisulfite compound

(b) Oxidise *o*,*a*-dinitrotoluene in the presence of acetone with alkaline potassium permanganate and convert the product into the bisulfite compound [*GP* 238381 (*Fr.* 10, 358)]

Soluble in water but pptd. by sulfurous acid

Aqueous solution + NaOH — ppt. of indigo

Discoverers — von Baeyer and Drewsen 1882

Eugen Fischer and Oppermann 1892

Indigo Salt T (K) Formerly used for calico printing and for dyeing cotton from an aqueous solution followed by passage through warm caustic soda solution

Sensitive to light and best prepared immediately before use.

The yield of indigo is poor and the alkali exerts a mercerising effect on the cotton (*C.I.1179 (1st Edn.)* — unconfirmed)

Badische Co., *BP* 1266/82; *USP* 257814, 257815; *GP* 19768 (*Fr.* 1, 140)

Eugen Fischer, *FP* 193686; *GP* 48722 (*Fr.* 2, 98)

Kalle Co., *FP* 284324 and addns. of 13/4/99 and 3/5/99, 325109; *GP* 73377 (*Fr.* 3, 286), 105630, 108722, 109800, (*Fr.* 5, 407, 408, 409)

Usines du Rhône, *BP* 16917/02, 24871/10, 24872/10; *USP* 997301, 1015495; *FP* 316121, and addn. of 3/1/03, 421717, 421922; *GP* 146294, 148943, (*Fr.* 7, 274, 275), 160783 (*Fr.* 8, 423), 237358, 238381, 246659, (*Fr.* 10, 159, 358, 160)

von Baeyer & Drewsen, *Ber.* 15 (1882), 2856

Eugen Fischer & Oppermann, *Chem. Ztg.* 17 (1893), 1069

Levinstein, *JSCI*, 12 (1893), 908

Watson Smith, *JSCI*, 12 (1893), 988

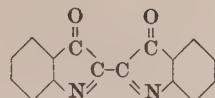
Kopp, *Bull. Soc. ind. Mulhouse*, (1897), 87

Romann, *Chem. Ztg.* 21 (1897), 78

Kayser, *Färberztg.* 12 (1910), 377

73010 Vat Dye

Bisulfite compound of



Oxidise indigo with lead peroxide in boiling benzene and convert the dehydroindigo into the bisulfite compound

Soluble in water

Discoverer — Kalb 1909

Dehydroindigo (Bisulfite compound)

Formerly used for dyeing cotton by impregnation and subsequent treatment with either dilute acid or alkali
As the product contained only 50% of dye the process has never been of practical importance

Kalb, *BP* 16377/09, 22714/09; *USP* 1012363; *FP* 405538, 412642; *GP* 216889, 217477, 220173, 222460, 237262, 239314, (*Fr.* 10, 358, 361, 363, 368, 364, 367)

Durand & Huguenin, *GP* 419061 (*Fr.* 15, 923)

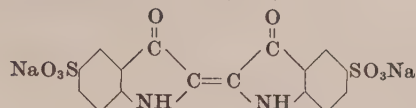
Kalb, *Ber.* 42 (1909), 3642, 3653, 3657, 3663, 4401; 43 (1910), 2210; 44 (1911), 1455; 45 (1912), 2136, 2141, 2149

Madelung, *Ann.* 405 (1914), 58; *Ber.* 57 (1924), 244

73015 C.I. Acid Blue 74 (Greenish blue)

C.I. Food Blue 1 (Blue)

C.I. Pigment Blue 63 (Blue)



Sulfonate indigo with concentrated or slightly fuming sulfuric acid

Note — For information on sulfonated natural indigo, see **C.I.75781**

The aluminium salt is used for colouring pharmaceuticals

C.I. Pigment Blue 63 is the aluminium salt

Discoverer — Barth 1740

Bayer Co., *GP* 63218 (*Fr.* 3, 283)

Badische Co., *BP* 8726/90; *USP* 524256; *FP* 206576; *GP* 68372 (*Fr.* 3, 280), 143141 (*Fr.* 2, 279)

BIOS 959, 8

FIAT 764 — Indigotin I

Dumas, *Ann.* 22 (1837), 72

Heymann, *Ber.* 24 (1891), 1476, 3066

Knietsch, *Ber.* 24 (1891), 2086

Vorländer & Schubart, *Ber.* 34 (1901), 1860

Binz & Prange, *Z. angew. Chem.* 40 (1927), 1474

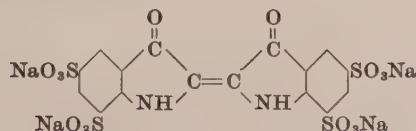
Soluble in water (blue)

Slightly soluble in ethanol

H₂SO₄ conc. — deep bluish violet; on dilution — blue

Aqueous solution + NaOH — green to yellowish green

Standard—BS 4143 (1967) Indigo Carmine for use in foodstuffs

73020 Acid Dye

Sulfonate indigo with 50% oleum at 70–80°C, salt out the product from the diluted mixture and neutralise the precipitated colour acid with sodium carbonate

Discoverer — Reissig

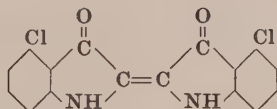
Indigotine P (B)

Juillard, *Bull. soc. chim.* 7 (1892), 619

Soluble in water (blue)

Insoluble in ethanol

H₂SO₄ conc. — blue; on dilution — blue appearing red by transmitted light

73025 Vat Dye

React 2-chloro-6-nitrobenzaldehyde with acetone by the Baeyer-Drewsen process (**C.I.73005**)

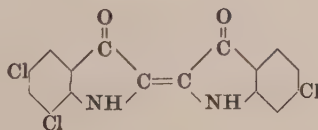
Discoverer — Janson 1899

Janson Indigo

Badische Co., *GP* 112400 (*Fr.* 5, 406)

BIOS 1482, 4 (Intermediate for Brilliant Indigo 4G, **C.I.73045**)

FIAT 1313, 2, 290

73030 Vat Dye (Bluish violet)

(a) Trichlorinate indigo

(b) Condense 2,5,7-trichloro-3-pseudoindolone (5,7-dichloroisatin- α -chloride) with 6-chloropseudoindoxyl

Discoverer — Bayer Co. 1910

Alizarine Indigo Violet B (By)

Fastness Properties (C): Chlorine 3, Light 5, Soda boil 3

FDX 885 (*PB* 82170) — Alizarinindigoviolett B

Soluble in pyridine (blue)

Na₂S₂O₄, alkaline — golden yellow; acid — pale yellow

73031 Solubilised Vat Dye (Bluish violet)

Leuco sulfuric ester of **C.I.73030**

Prepare by general method — see **C.I.59051A**

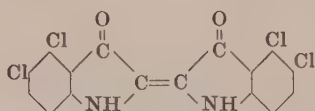
Discoverer and references —

General — see **C.I.59051A**

Indigosol Violet AZB (IG)

Fastness Properties (C): Chlorine 3, Light 5, Soda boil 3

Soluble in water

73035 **Vat Dye**

React *N*-(carboxymethyl)-5,6-dichloroanthranilic acid, methyl ester with sodium methoxide, treat the product with potassium hydroxide and oxidise with air

Discoverers — Julius, Villiger and Nawiasky 1909

Brilliant Indigo BASF/G

Formerly used for dyeing and printing cotton

The shade is sensitive to conc. nitric acid

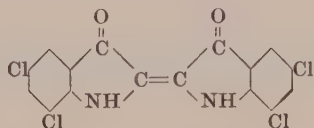
Badische Co., *BP* 23181/09; *USP* 955410, 957683; *FP* 409618; *GP* 220839, 234961, (*Fr.* 10, 337, 390)

Vlies, *JSDC*, 30 (1914), 23

Grandmougin & Seyder, *Ber.* 47 (1914), 2367

H₂SO₄ conc. — greenish blue; on dilution — blue ppt.

Na₂S₂O₄, alkaline — dark yellow

73040 **C.I. Vat Blue 41 (Reddish blue)**

(a) React *N*-(carboxymethyl)-3,5-dichloroanthranilic acid with acetic anhydride, treat the product with sodium hydroxide, and then oxidise with air

(b) Tetrachlorinate indigo in glacial acetic acid in the presence of acetic anhydride and sodium acetate (*FIAT* 764)

The commercial dye is a mixture of tri- and tetra-chloroindigo

Discoverer — Oberreit 1909

Badische Co., *BP* 6992/09, 22714/09, 28042/09; *USP* 761007, 948241, 1042679; *FP* 401506; *GP* 226319 (*Fr.* 9, 1191), 220839, 226689, 237262, (*Fr.* 10, 337, 351, 364), 32238 (*Fr.* 1, 145)

Ciba, *BP* 19793/08; *USP* 899863; *FP* 375514; *GP* 193971 (*Fr.* 9, 522)

Durand & Huguenin, *Sw.P* 111279, 111282, 111719

BIOS 1482, 9. *FIAT* 1313, 2, 290

FIAT 764 — Brillantindigo B

Gnehm, *Ber.* 17 (1884), 753

Danaila, *Compt. rend.* 149 (1909), 1383

Villiger, *Ber.* 42 (1909), 3529

Oberreit, *Compt. rend.* 150 (1910), 282

Vlies, *JSDC*, 30 (1914), 23

Grandmougin & Seyder, *Ber.* 47 (1914), 2365

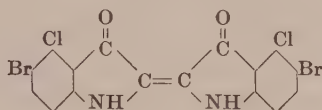
Insoluble in ethanol

H₂SO₄ conc. — bluish green; on dilution — blue ppt.

Na₂S₂O₄, alkaline — yellow

73041 **C.I. Solubilised Vat Blue 41 (Reddish blue)**

Leuco sulfuric ester of C.I. 73040

73045 **C.I. Vat Blue 2 (Greenish blue)**

(a) Brominate Janson Indigo (C.I.73025) in chloroacetic acid or in methylsulfuric acid (*FIAT* 764 and 1313), or brominate 4,4'-dichloroindigotin in cold sulfuric acid (*GP* 234961)

(b) React 5-bromo-*N*-(carboxymethyl)-6-chloroanthranilic acid, methyl ester with sodium methoxide, treat the product with potassium hydroxide, and oxidise with air (*USP* 957683)

Discoverers — Julius, Villiger and Nawiasky 1909

Badische Co., *BP* 6992/09, 23181/09; *USP* 948241, 957683; *FP* 401506, 409618; *GP* 220839, 226689, 234961, (*Fr.* 10, 337, 351, 390)

Ciba, *BP* 19563/08; *USP* 872115; *GP* 195085 (*Fr.* 9, 526)

Cassella Co., *USP* 1029066; *FP* 447629; *GP* 260461 (*Fr.* 11, 339)

BIOS 1482, 5; *BIOS-MISC* 20, App. 49

FIAT 1313, 2, 290

FIAT 764 — Brillantindigo 4G

von Gallois, *Färberztg.* 22 (1911), 316

Grandmougin & Seyder, *Ber.* 47 (1914), 2367

Vlies, *JSDC*, 30 (1914), 23

Soluble in xylene (blue)

H₂SO₄ conc. — greenish blue; on dilution — blue flocculent ppt.

Na₂S₂O₄, alkaline — yellowish brown; acid — colourless

73046 **C.I. Solubilised Vat Blue 2 (Greenish blue)**

Leuco sulfuric ester of C.I.73045

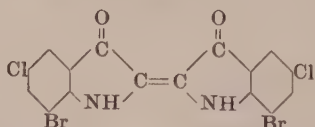
Prepare by general method — see C.I.59051A

Discoverer and references — I.G.

General — see C.I.59051A

Additional — *FIAT* 764 — Anthrasol O4G

Soluble in water

73050 **C.I. Vat Blue 37 (Blue)**

(a) Brominate 5,5'-dichloroindigotin (*GP* 224204, 224810)

(b) Chlorinate 7,7'-dibromoindigotin (*GP* 237262)

Discoverer — Badische Co. 1909

Badische Co., *BP* 22714/09; *FP* 399285; *GP* 224204, 237262, (*Fr.* 10, 389, 364)

M.L.B., *BP* 25513/07; *USP* 918920; *FP* 394237; *GP* 224810 (*Fr.* 10, 380), 251569, 251570, 260461, (*Fr.* 11, 330, 332, 339)

Villiger, *Ber.* 42 (1909), 3529

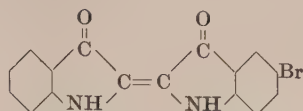
Masera, *Färberztg.* 22 (1911), 338

Vlies, *JSDC*, 30 (1914), 23

H₂SO₄ conc. — bluish green; on dilution — blue flocculent ppt.

Na₂S₂O₄, alkaline — yellowish brown; acid — colourless

73055 C.I. Vat Blue 3 (Reddish blue → Reddish navy)
C.I. Vat Blue 34



- (a) Monobrominate indigo in methylsulfuric acid (*FIAT* 764 and 1313)
 (b) React dry indigo or indigo white (**C.I.73001**) with bromine in presence of water
 (c) React indigo with bromine in presence of pyridine or starch, or in presence of aqueous hydrobromic, hydrochloric, or sulfuric acid
 (d) Condense 5-bromopseudoindoxyl with pseudoindoxyl

H₂SO₄ conc. — dull olive green; on dilution — blue ppt.
 Na₂S₂O₄ alkaline — yellow; acid — colourless

Discoverer — Rahtjen 1901

Rahtjen, *BP* 11022/01, 21040/02; *USP* 729217; *FP* 310925, 310926; *GP* 128575 (*Fr.* 6, 589), 139838 (*Fr.* 7, 279)
 M.L.B., *BP* 10516/02, 13429/02, 13430/02; *USP* 706921, 765996, 807782; *FP* 321002, 322198, 322348; *GP* 144249, 145910, 149899, 149940, 149941, 149983, 149989, 151866, 154511, (Fr. 7, 280, 281, 281, 282, 283, 283, 284, 285, 286), 161463 (Fr. 8, 428), 251569, 251570, (Fr. 11, 330, 332)
 Badische Co., *BP* 1135/01, 29583/12, 10583/13; *USP* 715074, 1133031; *FP* 311536, 322864, 462079; *GP* 131401 (Fr. 6, 590), 163280 (Fr. 8, 432), 265536 (Fr. 11, 323)
 Ciba, *BP* 6105/07; *USP* 883703, 888230; *FP* 375514 and addn. of 18/3/07; *GP* ap. G24394 (Fr. 9, 525)
 Cassella Co., *USP* 1029066; *FP* 447629; *GP* 260461 (Fr. 11, 339)
FIAT 1313, 2, 290
FIAT 764 — Indigo R, RR
 Baeyer, *Ber.* 12 (1879), 1315
 Vlies, *JSDC*, 30 (1914), 22

Insoluble in ethanol
 Soluble in toluene (blue)

73056 C.I. Solubilised Vat Blue 3 (Reddish blue)

Leuco sulfuric ester of **C.I.73055**

Prepare by general method — see **C.I.59051A**

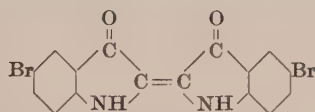
Discoverer and references —

General — see **C.I.59051A**

Additional — *FIAT* 764 — Anthrasol OR

Soluble in water (blue)

73060 C.I. Vat Blue 35 (Dull blue → Navy)



- (a) Dibrominate indigo in methylsulfuric acid (*FIAT* 764 and 1313)
 (b) Dibrominate indigo in boiling nitrobenzene with bromine

Note — The isomer 6,6'-dibromoindigo is **Tyrian Purple**. The dye is not used commercially; it was synthesised by Sachs and Kempf (*Ber.* 36 (1903), 3302) from 4-bromo-2-nitrobenzaldehyde by the Baeyer-Drewsen process

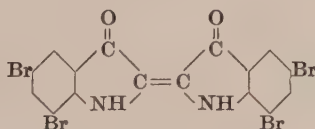
For information on naturally occurring Tyrian Purple, see **C.I.75800**

Discoverer — Engi 1907

Ciba, *BP* 5122/07; *USP* 856687; *FP* 375514; *GP* 193438, 208471, 209078, (Fr. 9, 523, 529, 530)
 Bayer Co., *BP* 4423/08, 5582/08; *USP* 937040; *FP* 394861; *GP* 205699, 223544, (Fr. 9, 537, 1190), 228137 (Fr. 10, 388)
 Sandoz, *BP* 2404/10; *GP* ap. C18783 (Fr. 10, 383)
 M.L.B., *USP* 918920; *GP* 251569, 251570, (Fr. 11, 330, 332)
 Cassella Co., *USP* 1029066; *FP* 447629; *GP* 260461 (Fr. 11, 339)
See also Patents under **C.I.73055**
FIAT 1313, 2, 290
FIAT 764 — Indigo RB
 Engi, *Chem. Ztg.* 32 (1908), 1178
 J. Martinet, *L'Indigo et ses Dérivés*, p. 562

Insoluble in ethanol
 H₂SO₄ conc. — bluish green; on dilution — blue ppt.
 Na₂S₂O₄, alkaline — yellow; acid — pale yellow

73065 C.I. Vat Blue 5 (Blue)



- (a) Brominate indigo in glacial acetic acid in the presence of acetic anhydride and sodium acetate (*FIAT* 764)
 (b) Tetrabrominate indigo in boiling nitrobenzene with bromine
 (c) React indigo in chlorosulfonic acid (*GP* 225227) or in sulfuryl chloride (*GP* 229304) with bromine

Discoverer — Engi 1907

Ciba, *BP* 5122/07; *USP* 856776; *FP* 375514; *GP* 193438, 208471, 209078, (Fr. 9, 523, 523, 529)
 M.L.B., *BP* 25513/07, 25514/07; *USP* 916031, 918920, 1043468; *FP* 394237, 404430; *GP* 224809, 224810, 225227, 230596, (Fr. 10, 370, 380, 382, 374), 251569, 251570, (Fr. 11, 332, 332)
 Bayer Co., *BP* 4423/08, 5582/09; *USP* 937041; *FP* 394861; *GP* 205699, 223544, (Fr. 9, 537, 1190), 228137 (Fr. 10, 388), 260848 (Fr. 11, 344)
 Badische Co., *BP* 2386/09, 28042/09; *FP* 399285; *GP* 224204, 229304, 237262, (Fr. 10, 389, 390, 364)
 Kalle Co., *BP* 15088/09
 Sandoz, *BP* 2404/10; *GP* 288899 (Fr. 12, 280), ap. C18785 (Fr. 10, 383)
 Cassella Co., *USP* 1029066; *FP* 447629; *GP* 260461 (Fr. 11, 339), 274866 (Fr. 12, 296)
 Wedekind Co., *GP* 284888 (Fr. 12, 288)
 Dow Chem. Co., *USP* 1473887
BIOS 1482, 11
FIAT 1313, 2, 290
FIAT 764 — Brillantindigo 4B
 Engi, *Chem. Ztg.* 32 (1908), 1178
 Erban, *Färberztg.* (1908), 138
 Grandmougin, *Ber.* 42 (1909), 4408
 Walther, *Z. Farb.-Ind.* 8 (1909), 359
 Danaila, *Compt. rend.* 149 (1909), 1383
 Dupont, *Chem. Ztg.* 34 (1910), 61
 Vlies, *JSDC*, 30 (1914), 23
 Noll, *Papierfabr.* 24 (1926), 593; *JSDC*, 43 (1927), 33

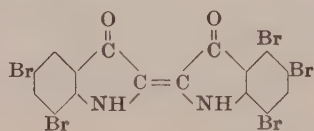
Insoluble in ethanol
 Soluble in xylene, tetrahydronaphthalene and nitrobenzene
 H₂SO₄ conc. — bluish green; on dilution — blue with blue ppt.
 Na₂S₂O₄, alkaline — yellow; acid — pale yellow

73066 C.I. Solubilised Vat Blue 5 (Blue)Leuco sulfuric ester of **C.I.73065**Prepare by general method — see **C.I.59051A**

Discoverer and references —

General — see **C.I.59051A**Additional — *BIOS* 960, 1. *FIAT* 1313, 2, 193
FIAT 764 — Anthrasol O4B

Soluble in water (blue)

73070 Vat Dye (Blue)

React indigo, or 5,5'-dibromo-, or 5,5',7,7'-tetrabromoindigo in chlorosulfonic acid with a sufficient amount of bromine to produce penta-brominated indigo

Discoverers — A. Schmidt and Thiess 1908

Indigo MLB/5B (MLB)M.L.B., *BP* 13789/08, 3019/09; *USP* 918920, 1070541; *FP* 409038, 392638, addn. of 8/2/09; *GP* 228960, 229351, 229352, 231407, (*Fr.* 10, 383, 384, 385, 386)Ciba, *FP* 375514 addns. of 16/10/09 and 5/12/10; *GP ap.* G30431 (*Fr.* 10, 370)Grandmougin, *Ber.* 43 (1910), 937Vlies, *JSDC*, 30 (1914), 23

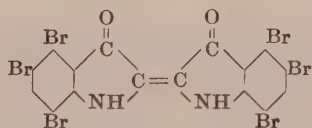
Soluble in toluene (blue, red by transmitted light)
H₂SO₄ conc. — greenish blue; on dilution — blue ppt.
Na₂S₂O₄, alkaline — yellow

73071 C.I. Solubilised Vat Blue 9 (Blue)Leuco sulfuric ester of **C.I.73070**May also contain some **C.I.73076**Prepare by general method — see **C.I.59051A**

Discoverer and references —

General — see **C.I.59051A**Additional — *FIAT* 1313, 2, 193

Soluble in water (blue)

73075 C.I. Vat Blue 48 (Blue)

(a) Brominate indigo in chlorosulfonic acid (Grandmougin)

(b) Brominate indigo under pressure with a large excess of bromine with or without inert solvents, and treat the bromination product (mainly heptabromoindigo) with bisulfite, which removes the unstable ("per-bromide" type) portion of the bromine (*GP* 236902)

Discoverers — A. Schmidt and Thiess 1908

M.L.B., *BP* 2609/09; *USP* 1061781; *FP* 392638, 409038; *GP* 224809, 236902, 236903, 228960, (*Fr.* 10, 370, 375, 381, 383)See also Patents under **C.I.73065** and **73070**Grandmougin, *Ber.* 43 (1910), 937Vlies, *JSDC*, 30 (1914), 23

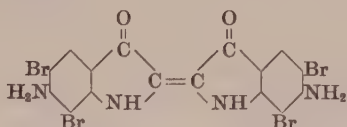
Insoluble in ethanol
H₂SO₄ conc. — blue; on dilution, blue ppt.
Na₂S₂O₄, alkaline — yellow; acid — pale yellow
Aqueous solution + NaOH — unaltered

73076 Solubilised Vat Dye (Blue)Leuco sulfuric ester of **C.I.73075**May also contain some **C.I.73071**Prepare by general method — see **C.I.59051A**

Discoverer

References — **Indigosol O6B (IG)**General — see **C.I.59051A**Additional — *FIAT* 1313, 2, 193

Soluble in water (blue)

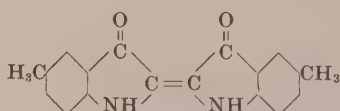
73080 Vat Dye

Brominate 6,6'-diaminoindigo with a large excess of bromine at room temperature, or with less bromine in nitrobenzene at 110–120°C, or in cold conc. sulfuric acid (*GP* 221531)

Discoverers — Engi and Kappeler 1909

Ciba Brown R (Ciba)Fastness Properties: Chlorine, poor; Light, good
Ciba, *BP* 14314/09; *USP* 940586; *FP* 414046; *GP* 221531 (*Fr.* 10, 399)Vlies, *JSDC*, 30 (1914), 23Grandmougin & Seyder, *Ber.* 47 (1914), 2372

Soluble in nitrobenzene (brownish red)
H₂SO₄ conc. — reddish blue; on dilution — red brown ppt.
Na₂S₂O₄, alkaline — yellowish brown

73085 Vat Dye

Condense 6-nitro-*m*-tolualdehyde with acetone in presence of sodium hydroxide and air

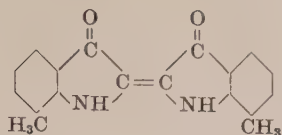
Discoverer — Koetschet 1898

Methyl Indigo R (Mo)Usines du Rhône, *BP* 25634/98, 152634; *USP* 662073, 662074, 662075, 662076; *GP* 113604, *ap.* S11980, (*Fr.* 6, 128, 571)Geigy, *BP* 6036/00; *GP* 119831 (*Fr.* 6, 584);cf. P. Meyer, *BP* 1788/83; *GP* 25136 (*Fr.* 1, 148)Bauer, *GP* 193633 (*Fr.* 9, 518)Koetschet, *Rev. gén. Mat. col.* 4 (1900), 159Blank, *Ber.* 31 (1898), 1817Kuhara & Chikashigé, *Am. Chem. J.* 27 (1902), 12

Almost insoluble in ethanol and acetone
Na₂S₂O₄, alkaline — yellow

73090

Vat Dye



(a) Condense chloroacetic acid with *o*-toluidine, fuse the product with an alkali hydroxide, and oxidise the leuco-compound (GP 58276)

(b) Condense 2-nitro-*m*-tolualdehyde with acetone in presence of sodium hydroxide and air (GP 113604, GP *ap.* S11980)

H₂SO₄ conc. — olive brown; on dilution — green and blue on heating

HNO₃ conc. — decolorised

Na₂S₂O₄, alkaline — yellow

Discoverers — Heumann (Prep. a) 1890

Koetschet (Prep. b) 1898

Indigo Pure BASF/G (B)

Greener and faster to chlorine than indigo

Badišche Co., BP 8726/90, 13627/90; FP 206567; GP 58276 (Fr. 3, 276)

Usines du Rhône, BP 25634/98; USP 662073, 662074, 662075, 662076; GP 113604, *ap.* S11980, (Fr. 6, 138, 571)

Geigy, BP 6036/00; GP 119831 (Fr. 6, 584)

Bauer, GP 193633 (Fr. 9, 518)

Heumann, Ber. 24 (1891), 978

Koetschet, Rev. gén. Mat. col. 4 (1900), 159

Kuhara & Chikashigé, Am. Chem. J. 27 (1902), 8

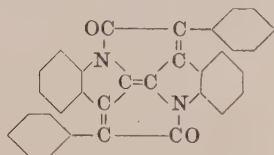
Grandmougin & Dessoulavy, Ber. 42 (1909), 3641, 4218

Vlies, JSDC, 30 (1914), 23

Slightly soluble in ethanol and acetone

73095

Pigment



React indigo with phenylacetyl chloride alone or in presence of nitrobenzene

Discoverer — Engi 1911

Ciba Lake Red B (Ciba)

Does not form a vat

Ciba, BP 8421/12; USP 1043682; FP 442948 addn. of 15/6/12; GP 254622, 254684, 260243, 263470, (Fr. 11, 291, 290, 293, 295)

Vlies, JSDC, 30 (1914), 24

Engi, Z. angew. Chem. 27 (1914), 146;

Chem. Ztg. 38 (1914), 199

Posner & Kemper, Ber. 57 (1924), 1311

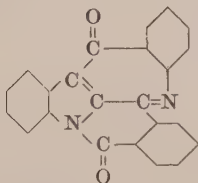
Insoluble in water

Soluble in nitrobenzene (carmines red and yellow fluorescence)

H₂SO₄ conc. — yellowish orange; on dilution — flocculent carmine red ppt.

73100

Vat Dye



Heat indigo with nitrobenzene and benzoyl chloride in presence of copper powder

Discoverers — Engi and Fröhlich 1910

Indigo Yellow 3G (Ciba)

Ciba, BP 29368/10; USP 994988, 1026574; FP 434828; GP *ap.* G32682, G32683, (Fr. 10, 400, 402), GP 250744 (Fr. 11, 297), 254734 (Fr. 10, 1334), 259145, 267384, 270943, (Fr. 11, 292, 299, 298), 312601 (Fr. 13, 463)

M.L.B., GP 247154 (Fr. 10, 403), 247155, 248250, (Fr. 11, 300, 301), 257457 (Fr. 10, 1334)

Wuth, Chem. Ztg. 35 (1911), 667

Vlies, JSDC, 30 (1914), 24

Engi, Z. angew. Chem. 27 (1914), 145;

Chem. Ztg. 38 (1914), 199

Posner & Hofmeister, Ber. 59 (1926), 1827

Hope, Kersey & Richter, JCS (1933), 1000

JSDC, 50 (1934), 117

de Diesbach, de Bie, & Rubli, Helv. Chim. Acta, 17 (1934), 1139

de Diesbach & Klement, *ibid.* 24 (1941), 158

de Diesbach, Capponi & Farquet, *ibid.* 32 (1949), 1214

Hope & Anderson, JCS (1936), 1474

Staunton & Topham, JCS (1953), 1889

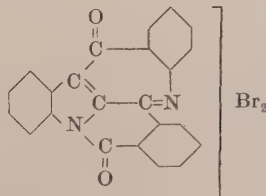
Soluble in toluene (yellow)

H₂SO₄ conc. — brownish red; on dilution — greenish yellow flocculent ppt.

Na₂S₂O₄, alkaline — bluish red

73105

Vat Dye



Dibrominate C.I.73100

Discoverers — Engi and Fröhlich 1911

Ciba Yellow G (Ciba)

Fastness Properties: Chlorine, good; Light, good

Ciba, BP 8900/11; USP 997766; FP 437181; GP 246837 (Fr. 10, 400)

Engi, Z. angew. Chem. 27 (1914), 145; Chem. Ztg. 38 (1914), 199

Vlies, JSDC, 30 (1914), 24

Soluble in xylene (yellow)

H₂SO₄ conc. — yellowish red; on dilution — greenish yellow

Na₂S₂O₄, alkaline — crimson

73106

Vat Dye

Treat C.I.73105 with sodium hydrosulfide or hydrosulfite

H₂SO₄ conc. — orange-brown; on dilution — orange-yellow ppt.

Na₂S₂O₄, alkaline — crimson

Discoverer — Engi 1912

Ciba Yellow 5R (Ciba)

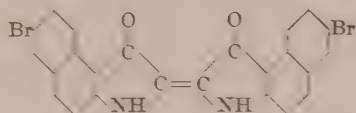
Ciba, BP 9940/12; USP 1074850; FP 442805; GP 257973 (Fr. 11, 289)

Engi, Z. angew. Chem. 27 (1914), 145; Chem. Ztg. 38 (1914), 199

Vlies, JSDC, 30 (1914), 24

73110

Vat Dye



Monobrominate 3H-benz[e]indole-1,2-dione, treat the product with phosphorus pentachloride, reduce with hydriodic acid or with an alkaline hydrosulfide, and oxidise

Discoverer — Engi 1907

Ciba Green G (Ciba)

Dyes cellulose green not fast to chlorine and becoming blue on soaping

Ciba, *BP* 10327/07; *USP* 872227; *FP* 386858; *GP* 193970 (*Fr.* 9, 531)

Engi, *Chem. Ztg.* 32 (1908), 1178

Vlies, *JSDC*, 30 (1914), 23

Jones, *JSDC*, 39 (1923), 202

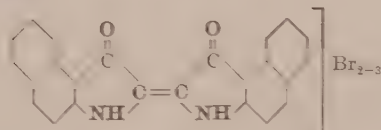
Soluble in xylene (green)

H₂SO₄ conc. — bluish green; on dilution — green ppt.

Na₂S₂O₄, alkaline — brownish yellow

73115

Vat Dye



Di(or tri)brominate β-naphthindigo (dibenz[e,e']indigo)

Na₂S₂O₄, alkaline — brownish yellow

Discoverers — A. Schmidt and Voss 1907

Helindon Green G (MLB)

Fastness Properties: Chlorine, moderate; Light, moderate; Soda boil, poor

M.L.B., *BP* 5299/08; *USP* 932334; *FP* 397751; *GP* 207487 (*Fr.* 9, 536); cf. *GP* 206352 (*Fr.* 9, 535)

Dreyfus & Dreyfus, *FP* 326168 and addn. of 25/8/95; *GP* 152019, 153418, (*Fr.* 7, 276, 277)

FDX 885 (*PB* 74762) — Helindongruen G

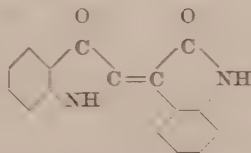
Vlies, *JSDC*, 30 (1914), 23

H₂SO₄ conc. — blackish-green; on dilution — olive green flocculent ppt.

73200

Vat Dye

Classical name Indirubin



(a) Condense isatin with pseudoindoxyl

(b) Condense 2-chloro-3-pseudoindolone (isatin-α-chloride) with oxindole

Note — For information on naturally occurring indirubin, see C.I. 75790

Martinet, *Compt. rend.* 169 (1919), 183

Sandmeyer, *Helv. Chim. Acta*, 2 (1919), 234

Robinson, *JSDC*, 37 (1921), 79

Soluble in ethanol (violet)

H₂SO₄ conc. — deep crimson

Na₂S₂O₄, alkaline — colourless

Indirubin

Valueless as a vat dye (crimson) as it becomes progressively bluer owing to the production of pseudoindoxyl by the further reduction of leuco-indirubin and subsequent formation of indigo on oxidation. During dyeing it is converted into not more than 50% of its weight of indigo

Badische Co., *USP* 250036, 250037, 625268; *FP* 283100; *GP* 17656 (*Fr.* 1, 134), 108128 (*Fr.* 5, 398)

Geigy, *BP* 128122; *GP* 313725 (*Fr.* 13, 448)

Schunck, *Phil. Mag.* 10 (1855), 73; 15 (1858), 29, 117, 183; *JCS*, 35 (1879), 528

Baeyer & Emmerling, *Ber.* 3 (1870), 515

Farrer, *Ber.* 17 (1884), 975

Rawson, *JSDC*, 2 (1886), 142

Rawson & Knecht, *JSDC*, 4 (1888), 67

Maillard, *Compt. rend.* 132 (1901), 990; *Bull. soc. chim.* 29, (1903), 756; 5 (1909), 1153; 9 (1911), 202

A. G. Perkin & Bloxam, *JCS*, 91 (1907), 1722; 97 (1910), 1460

Wahl & Bayard, *Compt. rend.* 148 (1909), 719; 156 (1913), 898, 1382; *Bull. soc. chim.* 5 (1909), 1043; 7 (1910), 1090; 9 (1911), 546

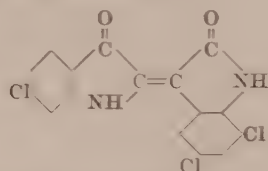
A. G. Perkin, *JCS*, 95 (1909), 847

Friedländer & Schwenk, *Ber.* 43 (1910), 1971

Pummerer, *Chem. Ztg.* 34 (1910), 571; *Ber.* 44 (1911), 346

73205

Vat Dye (Dull bluish red)



Condense 5,7-dichloroisatin with 6-chloropseudoindoxyl

Discoverers — Bayer, Herre, and R. Mayer 1912

Alizarine Indigo Red B (By)

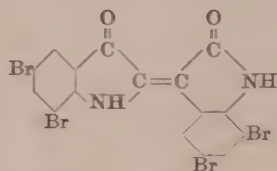
Fastness Properties on Wool (C): Light 8, Milling 5, Peroxide bleaching 5, Stoving 4-5, Washing 5

Bayer Co., *BP* 20267.12; *USP* 1074405; *FP* 455629; *GP* 258258 (*Fr.* 11, 302)

FDX 885 (*PB* 74762) — Helindonrot BR

73210

Vat Dye



(a) Tetrabrominate indirubin in nitrobenzene (*GP* 192682)

(b) Condense 5,7-dibromoisatin with 5,7-dibromopseudoindoxyl

Discoverer — Engi 1907

Ciba Heliotrop B (Ciba)

Fastness Properties: Chlorine, moderate; Light, moderate; Soda boil, poor

Ciba, *BP* 6106/07, 8530/08; *USP* 876158, 898452; *FP* 372627 addn. of 23/3/08 and 6/4/08; *GP* 192682, 203437, (*Fr.* 9, 533, 534)

Kalle Co., *GP ap.* K39424 (*Fr.* 10, 405)

M.L.B., *GP* 251569, 251570, (*Fr.* 11, 330, 332)

Engi, *Chem. Ztg.* 32 (1908), 1179

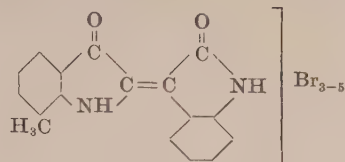
Vlies, *JSDC*, 30 (1914), 24

Jones, *JSDC*, 39 (1923), 202

Soluble in xylene (magenta red)

H₂SO₄ conc. — blackish green; on dilution — violet ppt.

Na₂S₂O₄, alkaline — yellowish olive



Condense 7-methylpseudoindoxyl with isatin and brominate the product, introducing 3-5 bromine atoms (PB 24886)

Discoverers — A. Schmidt and Thiess 1910

Helindon Violet D (MLB)

Fastness Properties: Chlorine, moderate; Light, good
M.L.B., BP 24886/10; USP 1028911; FP 421096; GP *ap.*
F29184 (Fr. 10, 406)
Vlies, JSDC, 30 (1914), 24

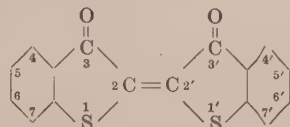
Soluble in xylene (magenta red)

H₂SO₄ conc. — green; on dilution — violet flocculent ppt.
Na₂S₂O₄ alkaline — yellow

(b) Thioindigo and its derivatives and homologues (Sulfur compounds)

73300 C.I. Vat Red 41 (Bluish red)

Classical name **Thioindigo Red B**



(a) Convert diazotised anthranilic acid to *o*-mercaptobenzoic acid, react with sodium chloroacetate, and convert the *o*-(carboxymethyl-mercapto)benzoic acid by a caustic fusion to 3(2*H*)-thianaphthenone, which is then oxidised by treatment with an aqueous suspension of sulfur at the boil (BIOS and FIAT process, originally disclosed in GP 192075 and 194254)

(b) Cyclise and oxidise acetylene-bis-thiosalicylic acid (2,2'-(vinylenedithio)dibenzoic acid) with chlorosulfonic acid (GP 205324)

BIOS 983, 1

FIAT 1313, 2, 295

FIAT 764 — Algolrot 5B

Friedländer, *Ber.* 39 (1906), 1060; 41 (1908), 227, 772; *Ann.* 351 (1907), 390

Knecht & Ilberr, *Ber.* 40 (1907), 3821

Münch, *Chem. Ztg.* 32 (1908), 811

Täuber, *Chem. Ztg.* 32 (1908), 1032; 33 (1909), 417

Gössling, *Chem. Ind.* 32 (1909), 565

Soluble in ethanol (bluish red) and xylene (red)

H₂SO₄ conc. — bright bluish green; on dilution — bluish red flocculent ppt.

Na₂S₂O₄, alkaline — reddish yellow; acid — pale yellow

Discoverers — Friedländer 1905; Münch 1907

Kalle Co., BP 22736/05, 23316/05, 11173/06, 14057/06, 16100/06, 16101/06; USP 819348, 850827; FP 359398, 359399, 366611, 367772; GP 177345, 177346, 177347, 184496, 188702, 192075, 194040, 194237, 194254, (Fr. 8, 478, 478, 479, 482, 481, 1371, 1370, 1373, 1375), 198712, 201231, 201232, 205450, (Fr. 9, 558, 540, 541, 541)

Ciba, BP 4687/06; FP 362876; GP 187586 (Fr. 8, 486)

Badische Co., BP 14507/06, 26053/07, 29583/12, 10583/13; USP 949592, 1133031, 1188543; FP 367739, 368775, 462079; GP *ap.* B43545, 205324, 265536, 274970, (Fr. 9, 571, 575, 323, 324)

M.L.B., BP 29765/06, 6930/07, 4541/08; USP 893499; FP 385675, 387178; GP 198509, 198692, 199349, 202707, 202708, (Fr. 9, 577, 587, 549, 590, 591), 231927 (Fr. 10, 428), 250464 (Fr. 11, 334)

I.G., BP 259999, 278890; GP 461490 (Fr. 16, 1125)

Agfa, BP 16517/10; FP 418353; GP 230641 (Fr. 10, 478), 386889 (Fr. 14, 928)

Wedekind Co., GP 278103, 283356, 284888, 289314, (Fr. 12, 292, 289, 288, 291)

Cassella Co., BP 17417/14, 18292/14; *Sw.P.* 71331, 71693, 77186, 77187, 92579, 92586, 92587, 92588, 92589, 92590; GP 360690, 364822, 367344, 367345, 367346, 367493, (Fr. 14, 908, 920, 912, 914, 918, 922)

Danaila, *Bull. Soc. chim.* 7 (1910), 359

Hutchinson & Smiles, *JCS*, 101 (1912), 570

Weissgerber & Kruber, *Ber.* 53 (1920), 1551

Bader, *Chim. et Ind.* (1924), 449

Riesz, *Ber.* 64 (1931), 1893

Tschilikin, *Ber.* 65 (1932), 1651

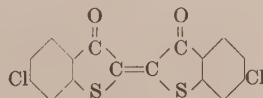
H. N. Bradley & Derrett-Smith, *JSDC*, 56 (1940), 97

W. Bradley, *JSDC*, 57 (1941), 9

Martinet, *Les Indigoides*, pp. 144-169

Truttwin, *Enzyklopädie der Küpenfarbstoffe*

73305 C.I. Vat Red 47 (Bluish pink → Bluish red)



(a) Chlorinate C.I.73300 in nitrobenzene in the cold and heat the intermediate product formed

(b) Cyclise and oxidise (*m*-chlorophenylmercapto)acetic acid in boiling nitrobenzene (BP 6490/07; USP 848354)

Discoverer — Engi 1907

Ciba, BP 6490/07; USP 848354, 848355; FP 372627; GP 225132 (Fr. 10, 512)

For preparation by the Herz sulfur chloride method see — Cassella & Co., GP 367493 (Fr. 14, 922)

BIOS 983, 6; 1156, 10

FIAT 764 — Indanthrendruckrot 3B

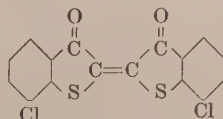
Soluble in xylene (red with yellow fluorescence)

H₂SO₄ conc. — green; on dilution — red flocculent ppt.

HNO₃ conc. — bluish red

Na₂S₂O₄, alkaline — yellow; acid — pale yellow

73310 C.I. Pigment Red 87 (Bluish red)



Oxidise 7-chloro-3(2*H*)-thianaphthenone

Discoverers — A. Schmidt and Bryk 1907

M.L.B., BP 8162/07; USP 916030; FP 386317; GP 241910, 243087, (Fr. 10, 502, 504)

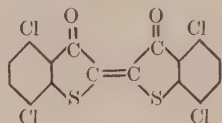
Guha & Chatterjee, *J. Ind. Chem. Soc.* 24 (1947), 476

Insoluble in water

Very slightly soluble in ethanol, xylene and lacquer solvent

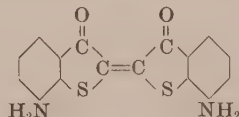
Insoluble in aliphatic petroleum solvents, and oleic acid

No bleeding in aqueous 5% HCl, 5% Na₂CO₃ and 10% NaOH

73312 C.I. Pigment Red 88 (Reddish violet)

Heat (2,5-dichlorophenylmercapto)acetic acid with chlorosulfonic acid or with conc. sulfuric acid

Discoverers—A. Schmidt and E. Bryk 1907
Kalle Co., *GP* 241910, 243087 (*Fr.* 10, 503, 505)
M.L.B., *BP* 8162/07; *USP* 916030; *FP* 386317
Gebauer-Fülneg & Figdor, *Monatsh. Chem.*, **48** (1927), 632

73315 Vat Dye (Dull greenish blue)

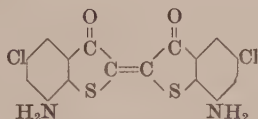
Cyclise and oxidise (o-nitrophenylmercapto)acetic acid with chlorosulfonic acid and reduce the dinitro-product with sodium sulfide (*USP* 959617)

$\text{Na}_2\text{S}_2\text{O}_4$, alkaline — yellowish orange; acid — pale yellow

Discoverers — A. Schmidt and Bryk 1909

Helindon Grey 2B (MLB)

Fastness Properties (C): Chlorine 1, Light 5, 5-6, 5-6, Soda boil 3
M.L.B., *BP* 8162/07, 16584/07, 16996/09, 18117/09; *USP* 916030, 947030, 959617; *FP* 386317, 390484, 404266; *GP* 216224 (*Fr.* 9, 519), 252771 (*Fr.* 11, 305)
Kalle Co., *GP* 239673, 240805, 241910, 243087, (*Fr.* 10, 508, 509, 502, 504)
Vlies, *JSDC*, **30** (1914), 25
Soluble in xylene (red violet)
 H_2SO_4 conc. — deep blue; on dilution — red with bluish red flocculent ppt.

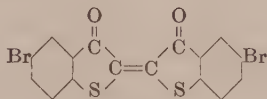
73320 Vat Dye

Cyclise and oxidise (4-chloro-2-nitrophenylmercapto)acetic acid with chlorosulfonic acid and reduce the product with sodium sulfide (*GP* 252771)

Discoverers — A. Schmidt and Bryk 1908

Helindon Grey BR (MLB)

Dyes wool and silk steel blue to blackish blue faster than **C.I. 73315**. Unsuitable for dyeing cotton
M.L.B., *BP* 8162/07, 16996/09, 18117/09; *USP* 916030, 947030, 959617; *FP* 386317, 404266; *GP* 216224 (*Fr.* 9, 519), 252771 (*Fr.* 11, 305)
Kalle Co., *GP* 241910, 243087, (*Fr.* 10, 502, 504)
Vlies, *JSDC*, **30** (1914), 23
Soluble in hot nitrobenzene (deep blue)
 H_2SO_4 conc. — blue; on dilution — crimson with dark blue ppt.
 $\text{Na}_2\text{S}_2\text{O}_4$, alkaline — yellow

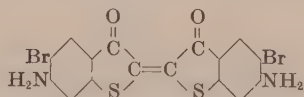
73325 Vat Dye

Dibrominate **C.I. 73300** in nitrobenzene (*GP* 225132)

Discoverer — Engi 1907

Ciba Bordeaux B (Ciba)

Fastness Properties: Chlorine, good; Light, good
Ciba, *BP* 6490/07; *USP* 867715; *FP* 1st addn. to 372627; *GP* 225132 (*Fr.* 9, 1194)
Engi, *Chem. Ztg.* **32** (1908), 1179
Vlies, *JSDC*, **30** (1914), 25
Soluble in xylene (bluish red with faint yellow fluorescence)
 H_2SO_4 conc. — yellowish green; on dilution — bluish violet ppt.
 $\text{Na}_2\text{S}_2\text{O}_4$, alkaline — yellowish orange

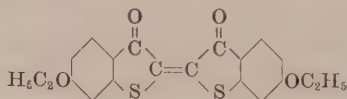
73330 Vat Dye (Dull reddish orange)

Oxidise 6-amino(or acetamido)-2,3-dihydro-3-oxo-2-thianaphthene-carboxylic acid and dibrominate the product in nitrobenzene, chlorobenzene, or glacial acetic acid

Discoverers — A. Schmidt and Pretzell 1907

Helindon Orange D (MLB)

Fastness Properties (C): Chlorine 4, Light 4, Soda boil 3
M.L.B., *BP* 16584/07; *USP* 872585; *FP* 390484; *GP* 198644 (*Fr.* 9, 581); cf. *USP* 872085; *GP* 203029 (*Fr.* 9, 582)
Vlies, *JSDC*, **30** (1914), 25
 H_2SO_4 conc. — cornflower blue; on dilution — brownish yellow ppt.
 $\text{Na}_2\text{S}_2\text{O}_4$, alkaline — dark yellow; acid — pale yellow

73335 C.I. Vat Orange 5 (Bright reddish orange)

Oxidise 6-ethoxy-3(2H)-thianaphthene-1-carboxylic acid, which is made either by the carboxamide route (*FIAT* 764 — *PB* 25626, fr. 2050) or by the Herz sulfur chloride method (*FIAT* 764 — *PB* 25626, fr. 2014)

Discoverers — Schirmacher and Deicke 1907

M.L.B., *BP* 1472/07; *USP* 867305; *FP* 384418; *GP* 234306 (*Fr.* 10, 429)
Kalle Co., *GP* 237680, 239090, (*Fr.* 10, 482, 485)
Cassella Co., *USP* 1243170, 1243171; *GP* 360690, 364822, 367346, 367493, (*Fr.* 14, 908, 920, 918, 922)
Du Pont, *USP* 1954707
BIOS 983, 1, 195
FIAT 1313, 2, 293
FIAT 764 — Algorange RF
Vlies, *JSDC*, **30** (1914), 25
Fierz-David, Suppl. 71
Lubs, *The Chemistry of Synthetic Dyes and Pigments* (1955), 566-567

H_2SO_4 conc. — bright bluish violet; on dilution — pale reddish orange ppt.
 $\text{Na}_2\text{S}_2\text{O}_4$, alkaline — yellow; acid — pale yellow

Insoluble in organic solvents

73336 C.I. Solubilised Vat Orange 5 (Bright reddish orange)Leuco sulfuric ester of **C.I.73335**

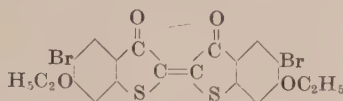
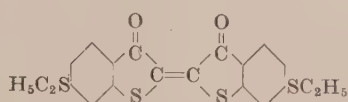
Prepare by general method — see C.I.59051A

Insoluble in ethanol and organic solvents
H₂SO₄ conc. — maroon; on dilution — red orange*Discoverer and references —*

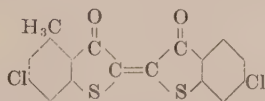
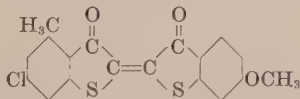
General — see C.I.59051A

Additional — Durand & Huguenin, *BP* 231889
I.G., *BP* 390081, 407702
Morton *et al.*, *BP* 247787
BIOS 960, 4. *FIAT* 1313, 2, 191
FIAT 764 — Anthrasolorange HR

Soluble in water (orange)

73340 C.I. Vat Red 26 (Yellowish red)Dibrominate **C.I.73335***Discoverers —* A. Schmidt and Bryk 1907M.L.B., *BP* 16017/08, 12321/10; *USP* 963813; *FP* 391917, 417937;
GP 213465 (*Fr.* 9, 585), 219268, 233601, (*Fr.* 10, 514, 513)
FIAT 764 — Algolscharlach GGRN
Vlies, *JSDC*, 30 (1914), 25
Griffith & Hope, *JCS*, 127 (1925), 990H₂SO₄ conc. — cornflower blue; on dilution — yellowish red, ppt.
Na₂S₂O₄, alkaline — yellowish brown; acid — pale yellow**73345 Vat Dye (Bright yellowish red)**Oxidise 6-(ethylmercapto)-3(2*H*)-thianaphthenone or its carboxylic acidNa₂S₂O₄, alkaline — golden yellow; acid — colourless*Discoverers —* Schirmacher and Leopold 1906**Helindon Scarlet S (MLB)**Fastness Properties (C): Chlorine 3, Light 3–4, Soda boil 3
M.L.B., *BP* 1472/07; *USP* 867306; *FP* 384418; *GP* 206567,
206568, (*Fr.* 9, 639, 639)
Kalle Co., *GP* 232277, 239089, (*Fr.* 10, 468, 482)
Vlies, *JSDC*, 30 (1914), 25
Jones, *JSDC*, 39 (1923), 201

Soluble in xylene (yellowish red)

H₂SO₄ conc. — bluish green; on dilution — orange ppt.**73350 C.I. Vat Red 5 (Bluish pink → Bluish red)**Condense 6-chloro-4-methyl-2-phenylimino-3(2*H*)-thianaphthenone with 6-chloro-3(2*H*)-thianaphthenone*Discoverers —* Herz and Brunner 1928I.G., *BP* 318595; *USP* 1841441; *FP* 680984; *GP* 525668 (*Fr.* 18,
1148)
BIOS 983, 6. *BIOS* 1156, 9
FIAT 764 — Indanthrendruckrosa FFBH₂SO₄ conc. — green; on dilution — redHNO₃ conc. — redNa₂S₂O₄, alkaline — yellow**73355 C.I. Vat Red 6 (Bright pink → Bright red)**Condense 6-chloro-4-methyl-3(2*H*)-thianaphthenone with 6-methoxy-3(2*H*)-thianaphthenone*Discoverers —* Schirmacher, Zahn, Hoffa, and Heyna 1923Fastness Properties: Light 6–7 (*FIAT* 1313, 2, 295)
I.G., *BP* 222094; *USP* 1790843; *GP* 419867 (*Fr.* 15, 607)
BIOS 983, 7. *BIOS* 1156, 16. *FIAT* 1313, 2, 196, 295
FIAT 764 — Indanthrenscharlach B

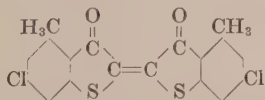
Insoluble in ethanol

H₂SO₄ conc. — green; on dilution — redHNO₃ conc. — redNa₂S₂O₄, alkaline — greenish yellow; acid — colourless**73356 C.I. Solubilised Vat Red 6 (Bright pink → Bright red)**Leuco sulfuric ester of **C.I.73355**

Prepare by general method — see C.I.59051A

Discoverer and references —

General — see C.I.59051A

Additional — *FIAT* 1313, 2, 196
FIAT 764 — Anthrasolscharlach IB**73360 C.I. Vat Red 1 (Bright bluish pink → Bright bluish red)**Oxidise 6-chloro-4-methyl-3(2*H*)-thianaphthenone, which is made either by the carboxamide route (*FIAT* 1313, 2, 192) or by the Herz sulfur chloride method (*FIAT* 764 — *PB* 25626, fr. 2069)*Discoverers —* Schirmacher and Landers 1907M.L.B., *BP* 5589/08; *USP* 892897; *FP* 397796; *GP* 239094
(*Fr.* 10, 491), 360690, 364822, 367346, (*Fr.* 14, 908, 920, 918)
Cassella Co., *USP* 1243170, 1243171; *GP* 367493 (*Fr.* 14, 922)
I.G., *BP* 295593, 334920; *USP* 1774650, 1844039; *GP* 500162,
514505, (*Fr.* 17, 618, 615), 622761 (*Fr.* 21, 1001)
BIOS 986, 94. *FIAT* 1313, 2, 292
FIAT 764 — Indanthrenbrillantrosa R
Okuyama & Sarra, *JSCI* (Japan), 39 (1936), 280

Insoluble in ethanol, and acetone

H₂SO₄ conc. — reddish, turning to green; on dilution — redHNO₃ — redNa₂S₂O₄, alkaline — yellow; acid — decolorised

73361 C.I. Solubilised Vat Red 1 (*Bright bluish pink*
→ *Bright bluish red*)

Leuco sulfuric ester of **C.I.73360**

Prepare by general method — see C.I.59051A

Insoluble in ethanol and organic solvents
H₂SO₄ conc. — greenish olive; on dilution — reddish violet

Discoverer and references —

General — see C.I.59051A

Additional — Durand & Huguenin, *BP* 231889

I.G., *BP* 413344

Sundour Fabrics, *BP* 247787

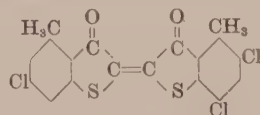
Scottish Dyes, *BP* 274156

BIOS 960, 4; 983, 3. *FIAT* 1313, 2, 191

FIAT 764 — Anthrasolrosa IR

Soluble in water (bluish red)

73365 C.I. Vat Red 2 (*Bright bluish pink* → *Bright bluish red*)



Condense 6-chloro-4-methyl-3(2*H*)-thianaphthenone with 5,7-dichloro-4-methyl-3(2*H*)-thianaphthenone

Discoverer — Heyna 1929

I.G., *BP* 281290, 359426; *USP* 1822967, 1832209; *GP* 540862, 555140 (*Fr.* 18, 1148, 488)

BIOS 960, 2. *BIOS* 983, 3. *BIOS* 1156, 3

FIAT 1313, 2, 194

FIAT 764 — Indanthrenbrillantrosa 3B

Na₂S₂O₄, alkaline — yellow; acid — colourless

73366 C.I. Solubilised Vat Red 2 (*Bright bluish pink*
→ *Bright bluish red*)

Leuco sulfuric ester of **C.I.73365**

Prepare by general method — see C.I.59051A

Discoverer — I.G.

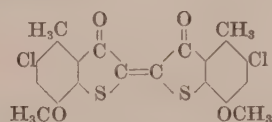
General — see C.I.59051A

Additional — *FIAT* 1313, 2, 194

FIAT 764 — Anthrasolbrillantrosa I3B

Soluble in water (bluish red)

73370 Vat Dye (*Violet*)



Cyclise and oxidise (4-chloro-6-methoxy-*m*-tolylmercapto)acetic acid with chlorosulfonic acid

Discoverer — Hoffa 1910

Helindon Violet B (MLB)

Fastness Properties (C): Chlorine 4, Light 4, Soda boil 3

M.L.B., *BP* 24569/10; *USP* 1025138; *FP* 432791; cf. *BP* 8162/07;

USP 916029, 916030; *FP* 386317

Kalle Co., *GP* 245544 (*Fr.* 10, 507); cf. *GP* 241910 (*Fr.* 10, 502)

Vlies, *JSDC*, 30 (1914), 25

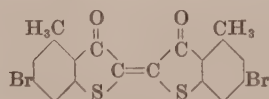
Cyrén, *Svensky Kem. Tids.* 31 (1919), 97

Soluble in xylene (reddish violet with brownish red fluorescence)

H₂SO₄ conc. — green; on dilution — reddish ppt.

Na₂S₂O₄, alkaline — yellowish-olive

73375 C.I. Pigment Red 86 (*Bright red*)



(a) Oxidise 6-bromo-4-methyl-3(2*H*)-thianaphthenone

(b) Brominate 4,4'-dimethylthioindigo

Discoverers — Schirmacher and Landers 1907

Helindon Pink BN (MLB)

Formerly used as a vat dye for dyeing silk and for calico printing

M.L.B., *BP* 5589/08, 12321/10; *USP* 892897, 963813; *FP* 397796, 417937

Kalle Co., *GP* 239094 (*Fr.* 10, 491)

von Gallois, *Färberztg.* 22 (1911), 316

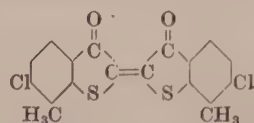
Vlies, *JSDC*, 30 (1914), 25

Soluble in xylene (bluish red with a yellow fluorescence)

H₂SO₄ conc. — dull greenish blue; on dilution — reddish flocculent ppt.

Na₂S₂O₄, alkaline — brownish yellow

73380 Vat Dye (*Bluish red*)



Cyclise and oxidise (3-chloro-*o*-tolylmercapto)acetic acid with chlorosulfonic acid

Discoverer — Stocker 1925

Helindon Red R (MLB)

Fastness Properties (C): Chlorine 4-5, Light 5
Soda boil 3

Ciba, *BP* 267177; *USP* 1755972; *Sw.P* 118232; *GP* 494948 (*Fr.* 16, 1094)

FDX 885 (*PB* 82170) — Algolrot BB

Na₂S₂O₄, alkaline — olive

73381 Solubilised Vat Dye (*Bluish red*)

Leuco sulfuric ester of **C.I.73380**

Prepare by general method — see C.I.59051A

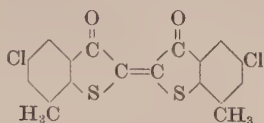
Discoverer and references —

Indigosol Red HR (IG)

General — see C.I.59051A

Additional — *FDX* 885 — Indigosolrot HR

73385 C.I. Vat Violet 2 (*Bright reddish violet*)
C.I. Pigment Violet 36 (*Reddish violet*)



Cyclise and oxidise (4-chloro-*o*-tolylmercapto)acetic acid with chlorosulfonic acid; this intermediate is made either from *m*-chlorotoluene by the sulfonyl chloride route (*BIOS* 983, 34) or from 4-chloro-*o*-toluidine by the disulfide method (*FIAT* 1313, 2, 296)

Discoverers — A. Schmidt and Bryk 1907
M.L.B., *BP* 2769/07, 8162/07; *USP* 881624, 916030; *FP* 384606, 386317; *GP* 208343 (*Fr.* 9, 579), 241910, 245632, (*Fr.* 10, 502, 498)
I.G., *USP* 1832209
BIOS 983, 34. *FIAT* 1313, 2, 296
FIAT 764 — Indanthrenrotviolett RH
Cyrén, *Svensky Kem. Tids.* 31 (1919), 97
Vlies, *JSDC*, 30 (1914), 25
Jones, *JSDC*, 39 (1923), 202
Martinet, *Les Indigoides*, p. 197

Soluble in xylene (blue red with weak yellow fluorescence)
 H_2SO_4 conc. — bright green; on dilution — red ppt.
 $\text{Na}_2\text{S}_2\text{O}_4$, alkaline — yellow; acid — colourless

73386 C.I. Solubilised Vat Violet 2 (*Bright reddish violet*)

Leuco sulfuric ester of C.I.73385

Prepare by general method — see C.I.59051A

Discoverer and references —

General — see C.I.59051A

Additional — Durand & Huguenin, *BP* 231889

Morton *et al.*, *BP* 247789

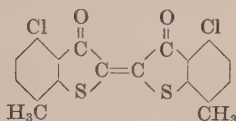
FIAT 764 — Anthrasolrotviolett IRH

Soluble in water (reddish violet)

Insoluble in ethanol and organic solvents

H_2SO_4 conc. — red fawn; on dilution — bluish grey

73390 Vat Dye (*Bluish red*)
C.I. Pigment Red 198 (*Reddish violet*)



Cyclise and oxidise (5-chloro-*o*-tolylmercapto)acetic acid with chlorosulfonic acid

Discoverers — A. Schmidt, Bryk, and Hoffa 1906

Helindon Red B (MLB) (Name also associated with some other dyes)

Fastness Properties (C): Chlorine 4-5, Light 4-5, 5, 5-6, Soda boil 3

Tendering accelerated on exposure to light

M.L.B., *BP* 2769/07, 8162/07; *USP* 881624, 916029, 916030;

FP 386317 and addns. of 8/4/07 and 22/6/07

Kalle Co., *GP* 198864, 199492, 202696, (*Fr.* 9, 578, 579, 556), 237680, 241839, 241910, 243087, 245631, 245632, (*Fr.* 10, 482, 494, 502, 504, 497, 498)

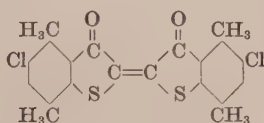
Badische Co., *GP* 224567 (*Fr.* 10, 473)

Vlies, *JSDC*, 30 (1914), 25

Soluble in xylene (red with yellow fluorescence)

H_2SO_4 conc. — yellowish green; on dilution — red ppt.
 $\text{Na}_2\text{S}_2\text{O}_4$, alkaline — yellowish olive; acid — yellow

73395 C.I. Vat Violet 3 (*Bright reddish violet*)
C.I. Pigment Violet 38 (*Reddish violet*)



Cyclise and oxidise (4-chloro-2,5-xylylmercapto)acetic acid with chlorosulfonic acid; this intermediate is made from chloro-*p*-xylene by the sulfonyl chloride route (*BIOS* 1156, 14)

Discoverers — A. Schmidt and Bryk 1907

Kalle Co., *GP* 241910 (*Fr.* 10, 502)

I.G., *BP* 281290; *USP* 916029, 1832209; *FP* 644319; *GP* 555140 (*Fr.* 18, 487)

BIOS 987, 7. *BIOS* 1156, 14. *FIAT* 1313, 2, 294

FIAT 764 — Indanthrenrotviolett 2RN

Insoluble in ethanol and organic solvents

H_2SO_4 conc. — dull green; on dilution — weak reddish violet

$\text{Na}_2\text{S}_2\text{O}_4$, alkaline — yellow; acid — colourless

73396 C.I. Solubilised Vat Violet 3 (*Bright reddish violet*)

Leuco sulfuric ester of C.I.73395

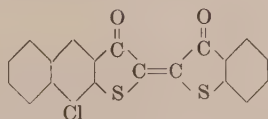
Prepare by general method — see C.I.59051A

Discoverer and references —

General — see C.I.59051A

Soluble in water (reddish violet)

73400 C.I. Vat Violet 4 (*Violet*)



Condense 9-chloro-3(2*H*)-thiophanthrenone with thianaphthenequinone

Discoverers — Zahn 1923; Staudinger, Tobler, Stocker, Jakob Müller, and Bucher (Ciba) 1922

M.L.B., *BP* 235252; *GP* 450852 (*Fr.* 15, 627)

Ciba, *BP* 233831; *USP* 1679277; *Sw.P.* 104475/22; *GP* 453087 (*Fr.* 16, 1098)

Bayer Co., *GP* 403053 (*Fr.* 14, 930)

BIOS 960, 2. *FIAT* 1313, 2, 194, 301

H_2SO_4 conc. — green; on dilution — violet

HNO_3 conc. — reddish violet

$\text{Na}_2\text{S}_2\text{O}_4$, alkaline — reddish yellow; acid — yellow

73401 C.I. Solubilised Vat Violet 4 (*Violet*)

Leuco sulfuric ester of C.I.73400

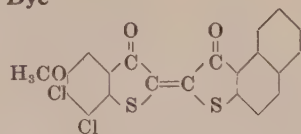
Prepare by general method — see C.I.59051A

Discoverer and references —

General — see C.I.59051A

Additional — *FIAT* 1313, 2, 194

FIAT 764 — Anthrasoldruckpurpur IR

73405 Vat Dye

Condense naphtho[2,1-*b*]thiophen-1(2*H*)-one with 6,7-dichloro-5-methoxy-3(2*H*)-thianaphthenone

Note — Produced only as parent compound for the preparation of **C.I.73406**

Discoverers — Zerweck and Albrecht 1933

I.G., *BP* 431661; *USP* 2076872; *GP* 631655 (*Fr.* 23, 733)

BIOS 1156, 20 (*FIAT* 1313, 2, 193 gives an incorrect formula)

FDX 885 (*PB* 74744) — Kuepenbraun 144

H_2SO_4 conc. — yellowish brown

HNO_3 — red brown

$\text{Na}_2\text{S}_2\text{O}_4$, alkaline — yellow; acid — grey greenish yellow

73406 C.I. Solubilised Vat Brown 7 (Dull reddish brown)

Leuco sulfuric ester of **C.I.73405**

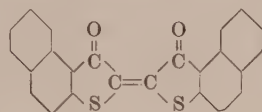
Prepare by general method — see *C.I.59051A*

Discoverer and references —

General — see *C.I.59051A*

Additional — *BIOS* 960, 2. *BIOS* 983, 8. *BIOS* 1156, 20
FIAT 764 — Anthrasolbraun IVD

Soluble in water (reddish brown)

**73410 C.I. Vat Brown 5 (Brown → Reddish brown)
C.I. Pigment Brown 27 (Brown)**

Oxidise naphtho[2,1-*b*]thiophen-1(2*H*)-one, which is made by cyclising (2-naphthylmercapto)acetic acid in chlorobenzene with phosphorus trichloride or thionyl chloride (*BIOS* 986, 260. *FIAT* 764)

Discoverers — Schirmacher and Brunner 1907

M.L.B., *BP* 15607/07; *USP* 888852; *GP* 239093 (*Fr.* 10, 489),
453280 (*Fr.* 15, 618)

BIOS 960, 2; 983, 18; 986, 260. *FIAT* 1313, 2, 190

FIAT 764 — Indanthrenbraun RRD

Friedländer & Woroshzow, *Ann.* 388 (1912), 1

Insoluble in ethanol

Slightly soluble in xylene (Bordeaux red)

H_2SO_4 conc. — dull brown changing to blue; on dilution — blue

$\text{Na}_2\text{S}_2\text{O}_4$, alkaline — reddish yellow; acid — pale brown

73411 C.I. Solubilised Vat Brown 5 (Reddish brown)

Leuco sulfuric ester of **C.I.73410**

Prepare by general method — see *C.I.59051A*

Discoverers and references — Friedländer and Woroshzow 1912

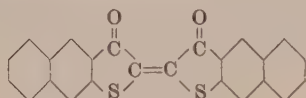
General — see *C.I.59051A*

Additional — *BIOS* 960, 2. *FIAT* 1313, 2, 190
FIAT 764 — Anthrasolbraun IRRD
Martinet, *Les Indigoides*, p. 171

H_2SO_4 conc. — yellowish green; on dilution — olive

Soluble in water

Insoluble in ethanol and organic solvents

73415 Vat Dye (Greenish grey)

Oxidise 3(2*H*)-thiophanthrenone

Discoverer — Friedländer 1910

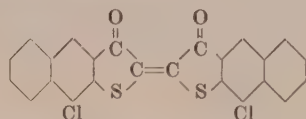
Algol Grey GG (IG)

Fastness Properties (C): Chlorine 3-4, Light 3-4, 4, 5,
Soda boil 3-4

Kalle Co., *GP* 240118 (*Fr.* 10, 510)

Friedländer & Woroshzow, *Ann.* 388 (1912), 1

$\text{Na}_2\text{S}_2\text{O}_4$, alkaline — reddish brown; acid — pale yellow

73420 Vat Dye (Dull blue)

Oxidise 9-chloro-3(2*H*)-thiophanthrenone

Discoverers — Thiess and Carl J. Müller 1923

Helindon Blue B (MLB)

Fastness Properties (C): Chlorine 3-4, Light 3-4, 4-5, 5,
Soda boil 3-4

M.L.B., *BP* 231567; *USP* 1728987; *GP* 411652 (*Fr.* 15, 614)

$\text{Na}_2\text{S}_2\text{O}_4$, alkaline — reddish brown; acid — yellow

73421 Solubilised Vat Dye (Dull blue)

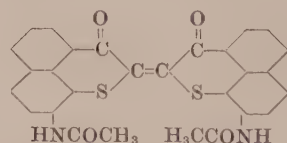
Leuco sulfuric ester of **C.I.73420**

Prepare by general method — see *C.I.59051A*

Discoverer and references —

Indigosol HB (IG)

General — see *C.I.59051A*

73425 Vat Dye (Greenish blue)

Cyclise (2-acetamido-1-naphthylmercapto)acetic acid to 9-acetamido-naphtho[1,8-*bc*]thiapyran-3(2*H*)-one and air oxidise (*GP* 414084)

Discoverers — Herz and Jens Müller 1923

Hydron Sky Blue FK (C)

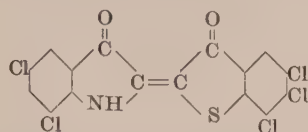
Fastness Properties (C): Chlorine 2, Light 5, Soda boil 3
Cassella Co., *USP* 1498913; *FP* 579912; *GP* 410310, 414084,
(*Fr.* 15, 608, 610)

FDX 885 (*PB* 82170) — Algolblau FFK

$\text{Na}_2\text{S}_2\text{O}_4$, alkaline — yellow → blue

(c) Indole-Thianaphthene dyes (Nitrogen-Sulfur compounds)

73595 C.I. Vat Violet 5 (Bluish violet)



Condense 2,5,7-trichloro-3-pseudoindolone (5,7-dichloroisatin- α -chloride) with 5,6,7-trichloro-3(2*H*)-thianaphthenone

Discoverers — Herz and Brunner 1924

Cassella Co., *BP* 274527; *USP* 1590685; *GP* 451411 (*Fr.* 15, 605)

BIOS 983, 6. *BIOS* 1156, 11

FIAT 1313, 2, 195 gives an *incorrect* formula for this dye

FIAT 764 — Indanthrendruckviolett BBF

H₂SO₄ conc. — blue green; on dilution — violet

HNO₃ conc. — violet

Na₂S₂O₄, alkaline — golden yellow; acid — pale yellow

73596 C.I. Solubilised Vat Violet 5 (Bluish violet)

Leuco sulfuric ester of C.I.73595

Prepare by general method — *see* C.I.59051A

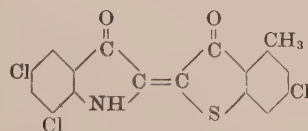
Discoverer and references —

General — *see* C.I.59051A

Additional — *FIAT* 764 — Anthrasoldruckviolett IBBF

Soluble in water (violet)

73600 Vat Dye



Condense 2,5,7-trichloro-3-pseudoindolone (5,7-dichloroisatin- α -chloride) with 6-chloro-4-methyl-3(2*H*)-thianaphthenone

Note — Produced only as parent compound for the preparation of C.I.73601

Discoverers — Schirmacher and Landers 1907

M.L.B., *BP* 5589/08; *USP* 892897; *GP* 239094 (*Fr.* 10, 491)

BIOS 960, 3. *BIOS* 983, 9. *BIOS* 1156, 24

FIAT 1313, 2, 195

H₂SO₄ conc. — green; on dilution — violet

HNO₃ conc. — red violet

Na₂S₂O₄, alkaline — yellow

73601 C.I. Solubilised Vat Violet 8 (Bright violet)

Leuco sulfuric ester of C.I.73600

Prepare by general method — *see* C.I.59051A

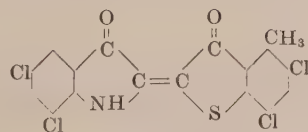
Discoverer and references —

General — *see* C.I.59051A

Additional — *FIAT* 764 — Anthrasoldruckviolett IRR

Soluble in water (violet)

73605 C.I. Vat Violet 18 (Bright bluish violet)



Condense 2,5,7-trichloro-3-pseudoindolone (5,7-dichloroisatin- α -chloride) with 5,7-dichloro-4-methyl-3(2*H*)-thianaphthenone

Discoverers — Herz and Brunner 1924

Cassella Co., *BP* 274527; *USP* 1590685, 1631865; *GP* 451411, 456863, (*Fr.* 15, 605, 606)

BIOS 983, 2. *BIOS* 1156, 2

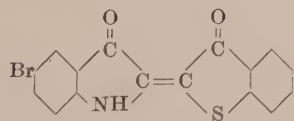
FIAT 764 — Algolviolett BBN

H₂SO₄ conc. — bluish green; on dilution — violet

HNO₃ conc. — violet

Na₂S₂O₄, alkaline — yellowish brown

73610 Vat Dye (Bluish grey)



Condense 2-(phenylimino)pseudoindoxyl with 3(2*H*)-thianaphthenone in presence of acetic anhydride or nitrobenzene and brominate the product (**Ciba Violet A**) in boiling nitrobenzene

Discoverer — Engi 1906

Ciba Grey G (Ciba)

Fastness Properties: Chlorine, good; Light, good

Ciba, *BP* 11760/06, 6490/07; *USP* 836309, 848356; *FP* 372627, 357459; *GP* 190292, 190293, (*Fr.* 8, 1375, 1376), 191098 (*Fr.* 9, 598)

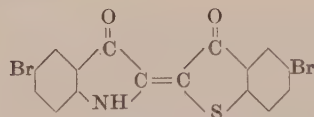
(*Application*) — *BP* 20312/09; *USP* 954273; *GP* 232069 (*Fr.* 10, 433)

Kalle Co., *BP* 11609/07; *FP* 378406; *GP* 193150, 206537, 206538, (*Fr.* 9, 594, 595, 595)

Friedländer, *Ber.* 41 (1908), 776

Vlies, *JSDC*, 30 (1914), 26

H₂SO₄ conc. — green; on dilution — violet ppt.

73615 **Vat Dye**

Condense 2-(phenylimino)pseudoindoxyl with 3(2*H*)-thianaphthenone and dibrominate the product in conc. sulfuric acid or chlorosulfonic acid

Na₂S₂O₄, alkaline — orange

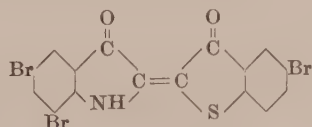
Discoverers — Engi 1906; Elbel and Wray 1908

Ciba Violet 3B (Ciba)

For dyeing cotton, wool, and silk, and for calico printing
Ciba, *BP* 11760/06, 6490/07; *USP* 836309, 848356; *FP* 372627, 375459; *GP* 190292, 190293, (*Fr.* 8, 1375, 1376), 191098 (*Fr.* 9, 598), 277358 (*Fr.* 12, 271)
Kalle Co., *BP* 11609/07, 21581/09; *FP* 378406, 407228; *GP* 193150, 206537, 206538, 225242, (*Fr.* 9, 594, 595, 595, 1196); *GP ap.* K38380 (*Fr.* 10, 513)
Engi, *Chem. Ztg.* 32 (1908), 1179
Vlies, *JSDC*, 30 (1914), 26

Soluble in xylene (reddish violet)

H₂SO₄ conc. — bluish green; on dilution — bluish violet ppt.

73620 **Vat Dye (Bright bluish violet)**

Condense 2-(phenylimino)pseudoindoxyl with 3(2*H*)-thianaphthenone and tribrominate the product (**Ciba Violet A**)

Discoverer — Engi 1906

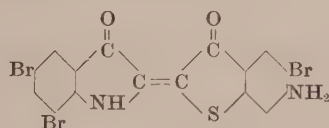
Ciba Violet B (Ciba)

Fastness Properties: Chlorine, good; Light, moderate
Ciba, *BP* 11760/06, 6490/07; *USP* 836309, 848355, 848356; *FP* 372627, 375459; *GP* 190292, 190293, (*Fr.* 8, 1375, 1376), 191098 (*Fr.* 9, 597), 277358 (*Fr.* 12, 271)
Engi, *Chem. Ztg.* 32 (1908), 1179
Vlies, *JSDC*, 30 (1914), 26

Soluble in xylene (reddish violet)

H₂SO₄ conc. — green; on dilution — reddish violet ppt.

Na₂S₂O₄, alkaline — orange

73625 **Vat Dye (Dull reddish brown)**

Condense 2-(phenylimino)pseudoindoxyl with 6-amino-3(2*H*)-thianaphthenone and tribrominate the product

Discoverers — A. Schmidt, Bryk, and Voss 1908

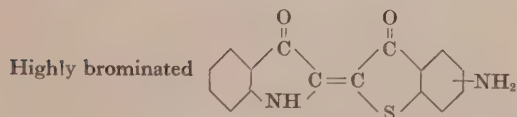
Helindon Brown 5R (MLB)

Fastness Properties (C): Chlorine 3–4, Light 3, Soda boil 2–3
M.L.B., *BP* 17265/09, 28170/09; *USP* 968697; *FP* 390484 addn. of 15/11/09, 404727; *GP* 201837 (*Fr.* 9, 593), 221529, 221530, 224205, 241343, (*Fr.* 10, 520, 521, 515, 517)
Vlies, *JSDC*, 30 (1914), 26

Slightly soluble in xylene (reddish brown)

H₂SO₄ conc. — bluish green; on dilution — reddish flocculent ppt.

Na₂S₂O₄, alkaline — dark yellow; acid — yellow

73630 **Vat Dye (Brown)**

Condense 2-(phenylimino)pseudoindoxyl with 5(or 6)-amino-3(2*H*)-thianaphthenone or (*m*[or *p*]-acetamidophenylmercapto)acetic acid and brominate the product in nitrobenzene with a large excess of bromine at 180–190°C (*GP* 241343)

Discoverers — A. Schmidt, Bryk, and Voss 1909

Helindon Brown 2R (MLB)

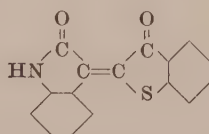
Fastness Properties (C): Chlorine 3, Light 4, Soda boil 3
M.L.B., *BP* 13550/11; *USP* 968697; *FP* 430002; *GP* 241343 (*Fr.* 10, 517)
Vlies, *JSDC*, 30 (1914), 26

Insoluble in ethanol

Soluble in xylene (reddish brown)

H₂SO₄ conc. — dark violet; on dilution — reddish brown ppt.

Na₂S₂O₄, alkaline — dull yellow

73635 **Vat Dye**

(a) Condense 3(2*H*)-thianaphthenone or its carboxylic acid with isatin in presence of water

(b) Condense oxindole with thianaphthenequinone (of theoretical interest only)

Discoverer — Albrecht 1905

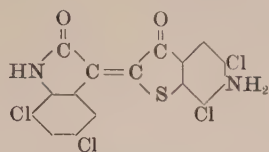
Thioindigo Scarlet R (K)

Fastness Properties: Chlorine, very good; Light, very good; Soda boil, moderate
Kalle Co., *BP* 17162/06; *USP* 874649; *FP* 366875; *AP* 38659, 39019; *GP* 182260 (*Fr.* 8, 484), 191097, 191098, (*Fr.* 9, 597, 597), 241327 (*Fr.* 10, 479)
Ciba, *BP* 10405/06; *USP* 841003; *FP* 362876 addn. of 2/5/06; *GP ap.* G22907 (*Fr.* 8, 487)
M.L.B., *BP* 5558/09; *USP* 943678; *FP* 410732
Application — Kalle Co., *GP* 201970, 202798, (*Fr.* 9, 636, 637), 229369 (*Fr.* 10, 433)
Wirther, *Färberztg.* (1907), 161
Bezdzik & Friedländer, *Mhft. Chem.*, 29 (1908), 376
Vlies, *JSDC*, 30 (1914), 26
Guha, *J. Ind. Chem. Soc.* 21 (1944), 87

Slightly soluble in ethanol

H₂SO₄ conc. — brown; on dilution — red ppt.

Na₂S₂O₄, alkaline — faintly yellow

73640 **Vat Dye (Dull yellowish orange)**

Condense 6-amino-5,7-dichloro-3(2H)-thianaphthenone with 5,7-dichloroisatin

Discoverers — Herz, Farr, Thiess, and Carl J. Müller 1927

Algol Brown GN (IG)

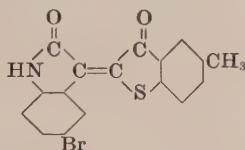
Fastness Properties (C): Chlorine 3, Light 4-5, 5, 5, Soda boil 4

I.G., BP 285389; USP 1778076; GP 489087 (*Fr.* 16, 1078)

H₂SO₄ conc. — violet; on dilution — brown

HNO₃ conc. — reddish yellow

Na₂S₂O₄, alkaline — yellow; acid — pale yellow

73645 **Vat Dye**

Condense 5-methyl-3(2H)-thianaphthenone with 5-bromoisatin

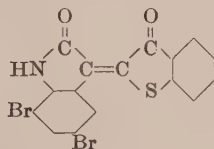
Discoverer — I.G.

Helindon Red FR (IG)

BIOS-MISC 20, App. 54

FDX 885 (PB 74762) — Helindonrot FR

Na₂S₂O₄, alkaline — yellowish brown

73650 **Vat Dye (Dull red)**

(a) Condense 3(2H)-thianaphthenone with 5,7-dibromoisatin

(b) Dibrominate **C.I.73635** in nitrobenzene, sulfuric acid, or chlorosulfonic acid

Discoverer — Engi 1906

Ciba Red G (Ciba)

Fastness Properties (C): Chlorine 4, Light 5, Soda boil 3

Ciba, BP 6490/07, 19158/07; USP 848355, 887609; FP 372627 and 3 addns.; GP 191097 (*Fr.* 9, 597), GP *ap.* G25207, G25209, (*Fr.* 9, 597, 597), GP 277358 (*Fr.* 12, 271)

FDX 885 (PB 74972 and PB 82170) — Cibarot G and Algol-scharlach RT

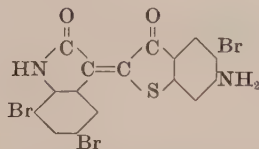
Engi, *Chem. Ztg.* 32 (1908), 1179

Vlies, *JSDC*, 30 (1914), 26

Slightly soluble in xylene (yellowish red with a faint yellow fluorescence)

H₂SO₄ conc. — olive brown; on dilution — red ppt.

Na₂S₂O₄, alkaline — yellow; acid — yellow

73655 **Vat Dye (Brown)**

Condense 6-amino-3(2H)-thianaphthenone with isatin or 5,7-dibromoisatin and brominate the product at 160°C in presence of nitrobenzene

Discoverers — A. Schmidt, Bryk, and Voss 1908

Helindon Brown G (MLB)

Fastness Properties (C): Chlorine 3, Light 3, Soda boil 3

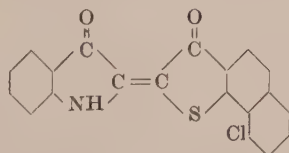
M.L.B., BP 28170/09, 2732/11; USP 968697; FP 390484 addn. of 15/11/09 and 19/1/11; GP 224205, 234058, (*Fr.* 10, 515, 516)

Vlies, *JSDC*, 30 (1914) 26

FDX 885 (PB 74762) — Helindonbraun G

H₂SO₄ conc. — magenta red; on dilution — brown ppt.

Na₂S₂O₄, alkaline — yellow; acid — colourless

73660 **C.I. Vat Black 35 (Greenish grey → Black)**

Condense 9-chloronaphtho[1,2-b]thiophen-3(2H)-one with 2-chloro-3-pseudoindolone (isatin- α -chloride)

Discoverers — Hoffa and Heyna 1923

M.L.B., BP 222120; USP 1537928; *Sw.P.* 112542

Ciba, BP 233831; USP 1679277; *Sw.P.* 112542; GP 453087 (*Fr.* 16, 1098)

BIOS 986, 96. FIAT 1313, 2, 189

FIAT 764 — Indanthrendruckschwarz BGL

H₂SO₄ conc. — black

Na₂S₂O₄, alkaline — yellow green; acid — black

73661 **C.I. Solubilised Vat Black 6 (Dull blue → Bluish black)**

Leuco sulfuric ester of **C.I.73660**

Prepare by general method — see C.I.59051A

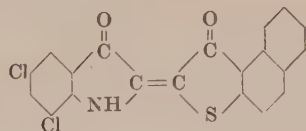
Discoverer and references —

General — see C.I.59051A

Additional — I.G., BP 529427; FP 855527; *Sw.P.* 213911

FIAT 764 — Anthrasolblauschwarz IRD

Soluble in water (bluish black)

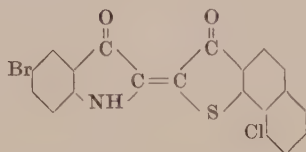
73665 C.I. Vat Brown 42 (Brown)

Condense naphtho[2,1-*b*]thiophen-1(2*H*)-one with 2,2,5,7-tetra-chloropseudoindoxyl

Discoverers — Bauer and Herre 1921

Bayer Co., *BP* 198415; *USP* 1434983; *GP* 400630 (*Fr.* 14, 929)
BIOS 983, 5. *BIOS* 1156, 9
FDX 885 (*PB* 74778)
FIAT 764 — Indanthrendruckbraun R, RS

H_2SO_4 conc. — reddish brown; on dilution — brown
 $\text{Na}_2\text{S}_2\text{O}_4$, alkaline — yellowish orange; acid — yellow

73670 C.I. Vat Black 1 (Bluish grey → Bluish black)

Condense 9-chloronaphtho[1,2-*b*]thiophen-3(2*H*)-one with 5-bromo-2-chloro-3-pseudoindolone (5-bromoisatin- α -chloride)

Discoverers — Staudinger, Tobler, Stocker, Jakob Müller, and Bucher 1922 (Ciba)

Hoffa and Heyna 1923 (MLB)
USP 1679277; *GP* 453087 (*Fr.* 16, 1098)
BP 222120; *USP* 1537928; *GP ap.* F54717/23 dropped
BIOS 960, 3. *BIOS* 983, 4, 24. *BIOS* 986, 96
FIAT 1313, 2, 195
FIAT 764 — Indanthrendruckschwarz BL

Insoluble in organic solvents
 H_2SO_4 conc. — olive; on dilution — black ppt.
 HNO_3 conc. — black
 $\text{Na}_2\text{S}_2\text{O}_4$, alkaline — golden yellow; acid — pale yellow

73671 C.I. Solubilised Vat Black 1 (Bluish grey → Bluish black)

Leuco sulfuric ester of **C.I.73670**

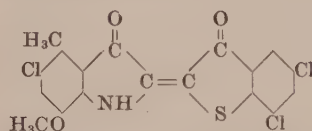
Prepare by general method — see C.I.59051A

Discoverer and references — Ciba and I.G.

General — see C.I.59051A

Additional — *FIAT* 764 — Anthrasolgrau IBL

Soluble in water (pale yellow)

73675 C.I. Vat Blue 36 (Blue)

Condense 5-chloro-7-methoxy-4-methylpseudoindoxyl with 5,7-dichloro-3(2*H*)-thianaphthenone

Discoverers — Thiess, Meissner, Zerweck, and Runne 1928

I.G., *BP* 309379; *USP* 1925217; *GP* 546006 (*Fr.* 18, 1158)
BIOS 960, 2. *BIOS* 983, 4 (Formula shows the chlorines in the thianaphthenone structure in incorrect positions). *BIOS* 986, 89 (for **Blau Isatin**). *BIOS* 1156, 5
FIAT 1313, 2, 194
FIAT 764 — Indanthrendruckblau B

H_2SO_4 conc. — bluish green
 $\text{Na}_2\text{S}_2\text{O}_4$, alkaline — yellow; acid — pale yellow

73676 Solubilised Vat Dye (Blue)

Leuco sulfuric ester of **C.I.73675**

Prepare by general method — see C.I.59051A

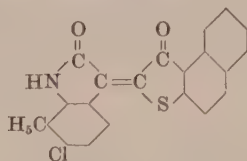
Discoverer and references —

Anthrasol Printing Blue IB (FH)

General — see C.I.59051A

Additional — *FIAT* 764 — Anthrasoldruckblau IB

Soluble in water (blue)

73680 Vat Dye (Reddish brown)

Condense naphtho[2,1-*b*]thiophen-1(2*H*)-one with 6-chloro-7-methylisatin

Discoverers — Bauer and Herre 1927

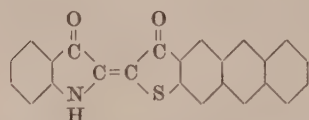
Indanthren Printing Brown 3R (IG)

Fastness Properties (C): Chlorine 3-4, Light 5, 6, 6, Soda boil 4

Tendering accelerated on exposure to light

I.G., *BP* 285389; *USP* 1778076; *GP* 489087 (*Fr.* 16, 1078)
BIOS 983, 5 (Discloses an incorrect formula for this dye),
BIOS 986, 91, 260
FDX 885 (*PB* 74778)
FIAT 764 — Indanthrendruckbraun 3R

$\text{Na}_2\text{S}_2\text{O}_4$, alkaline — golden yellow; acid — yellow

73685 Vat Dye

Condense 3-chloro-2-anthraquinonecarboxylic acid with mercaptoacetic acid, reduce and cyclise the product. Condense with 2-(phenylimino)pseudoindoxyl

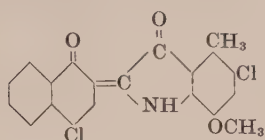
Discoverers — Mayer and Würzler 1924

Ciba, *BP* 210413; *USP* 1561560; *FP* 576103; *Swiss P* 103649/51, 106465/9, *Formanek*, 2nd Edn. II, 730
GP 425352, 427905 (*Fr.* 15, 707, 710)

Slightly soluble in nitrobenzene (green)
 H_2SO_4 conc. — olive green; on dilution — green precipitate

(d) Miscellaneous Dyes

73800 C.I. Vat Blue 8 (Blue → Navy)



Condense 5-chloro-7-methoxy-4-methylpseudoindoxyl with 4-chloro-1,2-naphthoquinone, or condense 2,5-dichloro-7-methoxy-4-methyl-3-pseudoindolone with 4-chloro-1-naphthol (BIOS 983)

Discoverers — Thiess, Meissner, and Zerweck 1928
I.G., BP 318107; USP 1809224; GP 522296 (Fr. 17, 1081)
BIOS 960, 2. BIOS 983, 5, 32. BIOS 986, 89
FIAT 1313, 2, 194
FIAT 764 — Indanthrendruckblau 2G

H₂SO₄ conc. — bluish green
HNO₃ — bluish green to brownish yellow
Na₂S₂O₄, alkaline — yellow; acid — pale yellow

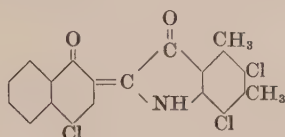
73801 C.I. Solubilised Vat Blue 8 (Blue → Navy)

Leuco sulfuric ester of C.I.73800

Prepare by general method — see C.I.59051A

Discoverer and references —
General — see C.I.59051A
Additional — FIAT 764 — Anthrasoldruckblau IGG
Soluble in water

73805 C.I. Vat Blue 40 (Reddish blue → Reddish navy)

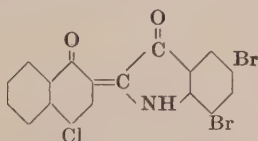


Condense 2, 5, 7 - trichloro - 4, 6 - dimethyl - 3 - pseudoindolone (5,7-dichloro-4,6-dimethylisatin- α -chloride) with 4-chloro-1-naphthol in chlorobenzene

Discoverer — Krauss 1925
I.G., BP 297376; USP 1698233; GP 493410 (Fr. 16, 1085)
BIOS 1156, 7
FIAT 764 — Indanthrendruckblau R

H₂SO₄ conc. — bluish green; on dilution — blue
HNO₃ conc. — violet
Na₂S₂O₄, alkaline — yellow; acid — pale yellow

73810 Vat Dye (Reddish blue)

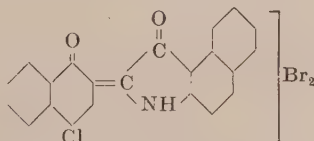


Condense 1-naphthol with 5,7-dibromo-2-chloro-3-pseudoindolone (5,7-dibromoisatin- α -chloride) and chlorinate with suluryl chloride

Discoverers — Bauer and Herre 1908
Alizarine Indigo 5R (By)
Fastness Properties (C): Chlorine 3-4, Light 5,
Soda boil 2
Bayer Co., USP 958465; GP 237199 (Fr. 10, 524)
FDX 885 (PB 82170) — Alizarinindigo 5R

Na₂S₂O₄, alkaline — reddish yellow

73811 Vat Dye (Bluish grey)

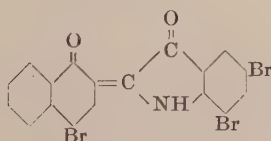


Condense 1-naphthol with dibromo-2-chloro-1H-benz[e]indol-1-one and chlorinate

Discoverer — Bayer Co. 1908
Alizarine Indigo Grey B (By)
Fastness Properties (C): Chlorine 3-4, Light 4-5,
Soda boil 2-3
Bayer Co., BP 28043/09; FP 407507; GP 237199, 241826,
(Fr. 10, 524, 526)
FDX 885 (PB 82170) — Algalgrau BG

Na₂S₂O₄, alkaline — reddish yellow

73815 Vat Dye (Dull blue)



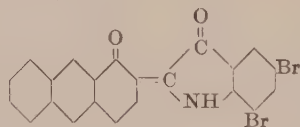
(a) Condense 5, 7 - dibromo - 2 - chloro - 3 - pseudoindolone (5,7-dibromoisatin- α -chloride) with 1-naphthol and brominate the product (USP 999439)

(b) Condense 5, 7 - dibromo - 2 - chloro - 3 - pseudoindolone with 4-bromo-1-naphthol (USP 958464)

Note — USP 958465 specifies the use of 4-chloro-1-naphthol for the preparation of an analogous dye (cf. C.I.73810)

Discoverers — Bauer and Herre 1908
Elbel and Wray 1910
Alizarine Indigo 3R (By)
Fastness Properties (C): Chlorine 4, Light 5, Soda boil 2
Bayer Co., BP 7819/09, 8203/11; USP 958464, 958465; FP
427326, 440224; GP 237199, 241825, (Fr. 10, 527, 525)
Kalle Co., BP 5808/10; USP 999439; FP 413799; cf. GP 207097
(Fr. 9, 606)
Vlies, JSDC, 30 (1914), 24

Soluble in xylene (blue)
H₂SO₄ conc. — bluish green; on dilution — blue flocculent ppt.
Na₂S₂O₄, alkaline — golden yellow

73820 **Vat Dye (Blue)**

(a) Condense 5,7 - dibromo - 2 - chloro - 3 - pseudoindolone (5,7-dibromoisatin- α -chloride) with 1-anthrol (USP 961396)

(b) Oxidise 1-anthrol with 3-oxo-2-indolinecarboxylic acid in acid solution with ferric chloride and dibromate (GP 305558)

H₂SO₄ conc. — olive-green; on dilution — blue ppt.
Na₂S₂O₄, alkaline — yellowish brown

Discoverers — Bauer and Herre 1908
Elbel and Kalle 1910

Alizarine Indigo G (By)

Fastness Properties (C): Chlorine 3-4, Light 4, Soda boil 3
Bayer Co., BP 7819/09, 8203/11; USP 961396, 980140; FP 407507, 440224; GP 237199 (Fr. 10, 524), 259293 (Fr. 11, 343)
Kalle Co., BP 3206/10, 5808/10; USP 999439; FP 413799
Jolles, GP 305558 (Fr. 13, 454)
FIAT 1313, 2, 193 shows an incorrect formula for this dye
FIAT 764 — Algolblau G
Bezdzik & Friedländer, *Mhft. Chem.* 30 (1909), 873
Vlies, *JSDC*, 30 (1914), 24
Jones, *JSDC*, 39 (1923), 203

Soluble in xylene (blue)

73821 **Solubilised Vat Dye**

Leuco sulfuric ester of C.I.73820

Prepare by general method — see C.I.59051A

Soluble in water

Discoverer and references —

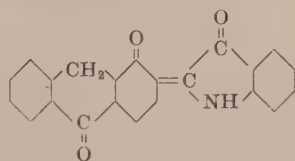
Indigosol AZG (IG)

General — see C.I.59051A

Additional — BIOS 960, 2

FIAT 1313, 2, 193 shows an incorrect formula for this dye

FIAT 764 — Anthrasol AZG

73825 **Vat Dye (Dull greenish blue)**

Condense 1,10-anthradiol with 2-(phenylimino)pseudoindoxyl

Na₂S₂O₄, alkaline — yellowish brown; acid — yellow

Discoverers — Welde and Homolka 1910

Helindon Blue 3GN (MLB)

Fastness Properties (C): Chlorine 2-3, Light 3, 3-4, 4, Soda boil 3

M.L.B., BP 222/11/void; USP 1025174; FP 424036; GP 242053 (Fr. 10, 532)

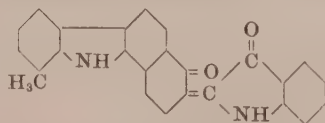
Vlies, *JSDC*, 30 (1914), 24

FDX 885 (PB 82170) — Algolblau 3GN

Insoluble in ethanol

Soluble in xylene (bluish green)

H₂SO₄ conc. — dark wine-red; on dilution — green flocculent ppt.

73830 **C.I. Vat Black 2 (Bluish grey → Bluish black)**

Condense 10-methyl-11H-benzo[a]carbazole-3,4-dione with 2-(phenylimino)pseudoindoxyl in acetic anhydride — formic acid solution

H₂SO₄ conc. — black; on dilution — blue black
Na₂S₂O₄, alkaline — greenish yellow; acid — pale yellow

Discoverers — M. P. Schmidt and Limpach 1910

Kalle Co., USP 1706902; GP 241997 (Fr. 10, 520)

BIOS 960, 2. BIOS 983, 4, 22. BIOS 986, 229

FIAT 1313, 2, 190, 196, 299

FIAT 764 — Indanthrendruckschwarz B

73831 **C.I. Solubilised Vat Black 2 (Bluish grey → Bluish black)**

Leuco sulfuric ester of C.I.73830

Prepare by general method — see C.I.59051A

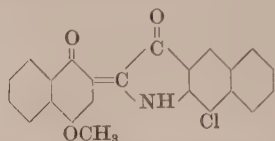
Discoverer and references —

General — see C.I.59051A

Additional — FIAT 1313, 2, 196

FIAT 764 — Anthrasoldruckschwarz IB

Soluble in water

73835 **Vat Dye (Bluish green)**

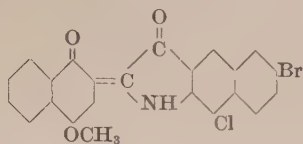
Condense 2,9-dichloro-3H-benz[f]indol-3-one with 4-methoxy-1-naphthol

Discoverers — Bauer, Neelmeier, and Nocken 1926

Helindon Green B (IG)

Fastness Properties (C) on wool: Light 7-8, 8, 8, Milling 5
I.G., BP 289154; FP 634305; AP 109698; GP 469343 (Fr. 16, 1085)

FIAT 764 — Helindongruen B

73840 **Vat Dye (Bluish green)**

Condense 6-bromo-2,9-dichloro-3*H*-benz[*f*]indol-3-one with 4-methoxy-1-naphthol

Discoverers — Bauer, Neelmeier, and Nocken 1926

Algol Brilliant Green BK (IG)

Fastness Properties (C): Chlorine 3–4, Light 2, 3, 3–4, Soda boil 3

Applicable by methods A/Q1, A/Q2, A/Q3 and Indigoid

I.G., *BP* 289154; *GP* 469343 (*Fr.* 16, 1085)

BIOS 963, 3. *BIOS* 1482, 12. *FIAT* 1313, 2, 196

FIAT 764 — Algolbrillantgruen BK

H₂SO₄ conc. — green

HNO₃ conc. — reddish violet

Na₂S₂O₄, alkaline — orange; acid — yellow

73841 **Solubilised Vat Dye**

Leuco sulfuric ester of **C.I.73840**

Prepare by general method — see C.I.59051A

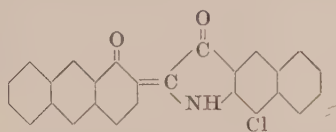
Discoverer and references — I.G.

Anthrasol Green AB (IG)

Fastness Properties (C): Chlorine 3–4, Light 5, Soda boil 3

General — see C.I.59051A

FDX 885 (*PB* 82175) — Anthrasolgruen AB

73845 **Vat Dye (Greenish blue)**

Condense 2,9-dichloro-3*H*-benz[*f*]indol-3-one with 1-anthrol

Discoverers — Bauer, Herre, and Mayer 1912

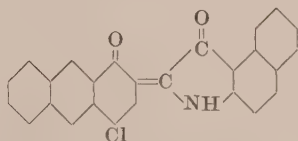
Alizarine Indigo 7G (By)

Fastness Properties (C): Chlorine 3, Light 3–4, Soda boil 3

Bayer Co., *BP* 21915/12; *USP* 1083518; *FP* 459628; *GP* 264265, 273536, (*Fr.* 11, 283, 309)

FDX 885 (*PB* 82170) — Algolblau 7G

Na₂S₂O₄, alkaline — reddish brown

73850 **Vat Dye (Bluish black)**

Condense 2-chloro-1*H*-benz[*e*]indol-1-one with 1-anthrol and chlorinate

Discoverers — Bauer and Herre 1922

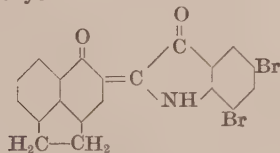
Alizarine Indigo Black B (By)

Fastness Properties (C): Chlorine 3–4, Light 4–5, Soda boil 3

Bayer Co., *BP* 205790; *USP* 1534351; *AP* 97918; *Sw.P* 105722; *GP* 414537 (*Fr.* 15, 628)

FDX 885 (*PB* 82170) — Algolschwarz B

Na₂S₂O₄, alkaline — yellowish brown

73855 **Vat Dye**

Condense 5,7-dibromo-2-chloro-3-pseudoindolone (5,7-dibromo-isatin- α -chloride) with 5-acenaphthenol

Discoverers — Bauer, Herre, and Mayer 1909

Alizarine Indigo B (By)

Fastness Properties: Chlorine, good

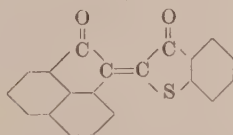
Bayer Co., *BP* 27029/09; *USP* 998596; *FP* 418344; *GP* 237266 (*Fr.* 10, 544)

Vlies, *JSDC*, 30 (1914), 24

Soluble in xylene (blue)

H₂SO₄ conc. — dull yellowish green; on dilution — blue ppt.

Na₂S₂O₄, alkaline — brownish yellow

73860 **C.I. Vat Red 45 (Bright pink \rightarrow Bright yellowish red)**

Condense 3(2*H*)-thianaphthenone (thioindoxyl) or its 2-carboxylic acid with acenaphthenequinone or its partial reduction product

Slightly soluble in xylene (yellowish red)

H₂SO₄ conc. — bright green; on dilution — red flocculent ppt.

Na₂S₂O₄, alkaline — reddish violet; acid — orange

Discoverers — Grob 1907; Elbel 1909

Ciba, *BP* 344/08, 20003/08; *USP* 891690, 915346; *FP* 385920 and addn. of 14-9-68; *GP* 205377, 210813, 211696, (*Fr.* 9, 607, 608, 610), 226244 (*Fr.* 10, 542)

Badische Co., *GP* 218992 (*Fr.* 10, 541)

Kalle Co., *BP* 21578/09, 21579/09, 19340/10, 19341/10; *USP* 965170; *FP* 407224, 407225, 419379; *GP* 224158, 224979, 228698, 232714, 233473, 236536, 243536, 248083, *ap.* K39836, (*Fr.* 10, 536, 196, 198, 538, 539, 540, 534, 536, 535)

BIOS 983, 2. *BIOS* 986, 9. *FIAT* 764 — Algolscharlach GG

Graebe & Gfeller, *Ann.* 276 (1893), 4

Grob, *Ber.* 41 (1908), 3333

Bezdzik & Friedländer, *Mhft. Chem.* 29 (1908), 386

Reissert, *Ber.* 44 (1911), 1749

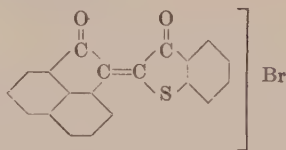
Vlies, *JSDC*, 30 (1914), 26

73861 **C.I. Solubilised Vat Red 45 (Bright yellowish red)**

Leuco sulfuric ester of C.I. 73860

73865

Vat Dye (Red)



(The bromine atom is in the acenaphthene nucleus)

Monobrominate **C.I.73860** in nitrobenzene

Discoverer — Basle Chem. Works 1907

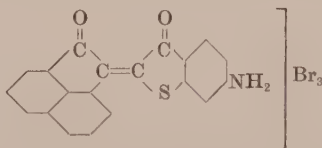
Ciba Red R (Ciba)

Fastness Properties: Chlorine, good; Light, good
 Ciba, *BP* 20003/08; *GP* 196349, 198510, 212870, 213504, (*Fr.* 9, 613, 613, 611, 614)
 Vlies, *JSDC*, **30** (1914), 26
 Mayer & Schönfelder, *Ber.* **55** (1922), 2972

Slightly soluble in xylene (yellowish red)
 H_2SO_4 conc. — bluish green; on dilution — red ppt.
 $\text{Na}_2\text{S}_2\text{O}_4$, alkaline — grey blue; acid — yellow red

73870

Vat Dye (Yellowish orange)



Condense 6-amino-3(2*H*)-thianaphthenone with acenaphthene-quinone in presence of ethanol and tribrominate the product in presence of sulfuric acid first at 0°C and then at 20–25°C

Discoverers — Engi and Fröhlich 1910

Ciba Orange G (Ciba)

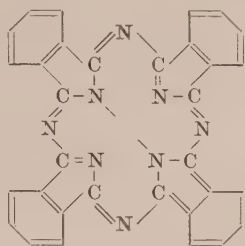
Fastness Properties: Chlorine, good; Light, good
 Ciba, *BP* 22067/11; *USP* 1081898; *FP* 372627 addn. of 28/10/10;
GP ap. G33665 (*Fr.* **10**, 546)

Insoluble in ethanol
 Slightly soluble in xylene (yellow)
 H_2SO_4 conc. — brown then green blue; on dilution — yellowish brown ppt.
 $\text{Na}_2\text{S}_2\text{O}_4$, alkaline — grey green; acid — red yellow

NOTES

PHTHALOCYANINE DYES AND PIGMENTS

This group consists of those dyes and pigments which contain the tetrabenzoporphyrine nucleus —



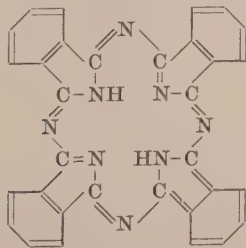
the latest discovered of the chromophores.

Metal-free phthalocyanine was prepared in 1907 by Braun and Tcherniac (*Ber.*, **40** (1907), 2709) while de Diesbach and Van der Weid (*Helv. Chim. Acta*, **10** (1927), 886) twenty years later prepared copper phthalocyanine but neither pair of workers realised the importance of what they had produced. Later the chemists of Scottish Dyes Ltd. (since incorporated into Imperial Chemical Industries Ltd.) noticed an intensely coloured greenish blue impurity when ammonia was passed through molten phthalic anhydride in an iron vessel, recognised its potential value as a pigment and so were led to work on its commercial development. They succeeded in producing brilliant greenish blue pigments to which the name phthalocyanine was given, the name being coined from *phthalic*, referring to the material they were made from, and *cyanine* referring to their greenish blue colour. Their brilliantly pure tones and the excellent fastness properties of certain members of this group quickly attracted users' notice and have made these products of much commercial importance. At first only pigments were available, later it was discovered that under suitable conditions some of them could be vatted and methods were also found by which various groups conferring dyeing properties could be introduced into the phthalocyanine molecule. Another development has been the formation of the dye from its intermediates *in situ* on the fibre. A number of reactive dyes contain phthalocyanine chromophores but the constitution of only one has been published.

Literature

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 A simplified discussion of the history, structure, methods of manufacture and commercial uses of phthalocyanine pigments.
 Bigelow, N. M., and Perkins, M. A., Chapter on *Phthalocyanine Pigments in Chemistry of Synthetic Dyes and Pigments*, A.C.S. Monograph 127 (Edited by H. A. Lubs) (New York, 1955), 577–606
 A comprehensive review of the chemistry and manufacture, 155 references
 Brouillard, R. E., *Amer. Ink Maker*, **32** (1954) (1), 32–35, 65; (2) 30–33, 65–67
 Thorough review of history, chemistry and uses, 78 references
 Dahlen, M. A., *Ind. Eng. Chem.*, **31** (1939), 839–847
 Review of chemical and industrial history
 Haddock, N. H., *JSDC*, **61** (1945), 68–75
 Review of the chemistry of the phthalocyanine colouring matters
 Linstead, R. P., *Ber.*, **72A** (1939), 93–103
 Review of synthesis, structure and properties
 Struve, W. S., Chapter on *Phthalocyanine Dyes in Chemistry of Synthetic Dyes and Pigments*, A.C.S. Monograph 127 (Edited by H. A. Lubs) (New York, 1955), 607–624
 A comprehensive review of the chemistry and manufacture, 69 references
 Venkataraman, K., *The Chemistry of Synthetic Dyes*, Vol. 2 (New York, 1952), 1118
 Wahl, H., *Teintex*, **19** (1954), 589
 General account of phthalocyanine chemistry
 BIOS 960, 32–69
 Account of I.G. processes and development work
 FIAT 1313, III, 273–347, 446–448
 General account of I.G. production and research activities, including a discussion of phthalocyanine sulfonic acids (304–308) and of polymorphic forms of phthalocyanine pigments (345, 346 and 446–448)

74100 C.I. Pigment Blue 16 (Bright greenish blue)



- (1) Heat phthalonitrile with a variety of organic substances, e.g. amides, phenols, aliphatic hydroxy compounds
- (2) Eliminate the metallic atom from labile metal phthalocyanines, e.g. by treating with a strong acid

Discoverers — Thorpe, Linstead and Thomas 1931

Scottish Dyes Ltd., BP 389842
 Du Pont, USP 2485167–8; 2556729 (Pigmentary β -form)
 I.C.I., BP 410814, 486782
 BIOS 960, 48 — Heliogen Blau G
 FIAT 1313, III, 273, 292, 298, 345 — Heliogen Blue G
 Byrne, Linstead & Lowe, JCS (1934), 1017
 Linstead & Lowe, JCS (1934), 1022
 Dent, Linstead & Lowe, JCS (1934), 1033
 Haddock, JSDC, **61** (1945), 68; *Research*, **1** (1948), 685
 Robertson, JCS (1935), 615; (1936), 1195; (1937), 219
 von Susich, FIAT 1313, III, 446
 Bigelow & Perkins, Allen, Lubs, 577, 590, 658
 I.G., BP 457526; GP 696334 (*Fr.-Bayer*, I-2, 853)
 I.C.I., USP 2214454

Insoluble in water, alcohol and hydrocarbons
 H_2SO_4 conc. — olive solution; on dilution — blue suspension

74120 Pigment (A yellowish green than C.I. 74260)

Polychlorinated metal-free phthalocyanine, containing 14–15 Cl atoms in the molecule

Treat metal-free phthalocyanine with chlorine at 180–220°C while the pigment is either dispersed in molten phthalic anhydride in presence of antimony trisulfide or kept in suspension in a "fluidised bed" at temperatures up to 380°C

H₂SO₄ conc. — olive solution; on dilution — green precipitate

Discoverers — Linstead and Dent 1935

Heliogen Green GG (IG)

I.C.I., BP 461268, 478256; USP 2214469, 2195984
I.G., BP 474740; USP 2276860; GP 717164, 740053, (Fr.-Bayer, I-2, 834, 838)

Du Pont, USP 2586598

BIOS 960, 68 — Heliogenrün GG

FIAT 1313, III, 288

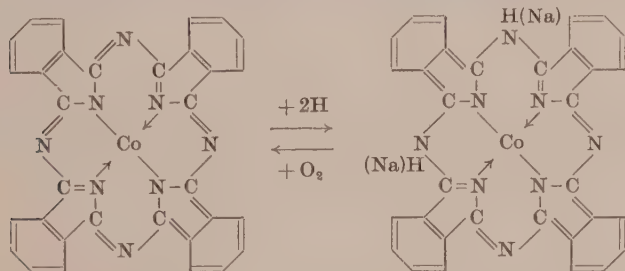
Barrett, Bradbrook, Dent & Linstead, JCS (1939), 1820

Bigelow & Perkins, Lubs, 578

74140 C.I. Vat Blue 29 (Bright blue)

Partly sulfonated cobalt phthalocyanine

With alkaline reducing agents, preferably in the usual caustic soda-hydrosulfite vat, this dye yields a kind of leuco compound,



Although reducible quinone groups typical of vat dyes are not present, displacements presumably occur in the quinonoid bonds of the phthalocyanine ring system under the influence of the reducing agent, so that the molecule is able to take up hydrogen atoms which can be replaced by alkali, i.e. this hydro compound can be ionised

Treat cobalt phthalocyanine with 10–20% oleum at 45–50°C until it is 25% sulfonated — USP 2613128

Discoverers — Baumann and Bienert 1948

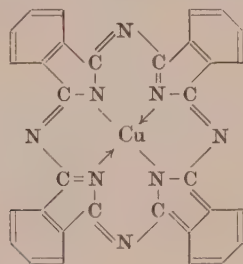
FBy, BP 704310; USP 2613128; GP 911997; Sw.P 282387

B.A.S.F., BP 681873; FP 1027652

Kunz, Text. Rund. 6 (1951), 546

Gund, JSDC, 69 (1953), 671

Bigelow & Perkins, Struve, Lubs, 593, 621

74160 C.I. Pigment Blue 15 (Bright blue)

Various methods, e.g. —

(1) Heat phthalonitrile with cuprous chloride at 180–200°C

(2) Heat phthalic anhydride, phthalimide or phthalamide with a copper salt and urea, cyanoguanidine or *p*-toluenesulfonamide and cuprous (or cupric) chloride in presence of ammonium molybdate or arsenic oxide (phthalic anhydride/urea process)

(3) Impregnate the fibre with 1,3-diiminoisindoline and a copper salt and heat in presence of reducing agents to form copper phthalocyanine *in situ*. This precursor is Phthalogen Brilliant Blue IF3G (C.I. Ingrain Blue 2); when a nickel salt is used, nickel phthalocyanine is formed *in situ* yielding a more greenish blue than the bright blue dyeing obtained with a copper salt—FBy, BP 698039, 698049, 698070; Baumann, Bienert, Roesch, Vollmann and Wolf, Angew. Chem. 68 (1956), 133–150; F. Gund, J.S.D.C., 76 (1960) 151–158

Discoverers — Dandridge, Drescher and Thomas 1928

Scottish Dyes, BP 322169

I.C.I., BP 410814, 464126, 476243

American Cyanamid Co., USP 2460779, 2460783

Du Pont, USP 2452606

Montecatini, BP 503029

Roberts Chemical Co., USP 2471794

Sherwin-Williams Co., BP 640576, 648688

Standard Ultramarine Co., USP 2469663

Wiswall, USP 2486351

BIOS 960, 33 — Heliogen Blue B

FD 2696/46 (PB 74220)

FIAT 1309, 8; 1313, III, 273–385 — Heliogen Blue B

Dent & Linstead, JCS (1934), 1027

Dent, Linstead & Lowe, JCS (1934), 1033

Barrett, Dent & Linstead, JCS (1936), 1719

Dahlen, Ind. Eng. Chem. (1939), 839

de Diesbach, et al., Helv. Chim. Acta, 10 (1927), 886

Haddock, JSDC, 61 (1945), 68; Research, 1 (1948), 685

Hamm & Norman, J. Appl. Phys. 19 (1948), 1097

I.C.I., JSDC, 52 (1936), 22

Stadlinger, Chem. Z. 60 (1936), 375

von Susich, FIAT 1313, III, 446

Tarantino, Stubbs, Cooke & Melsheimer, Calco Tech. Bull., No. 902 (1951)

Ghisolfi, Ind. vermic (Milan), 9 (1955), 181

Bigelow & Perkins, Allen, Lubs, 590, 658

Soluble in 98% H₂SO₄

Insoluble in water, alcohol and hydrocarbons

H₂SO₄ conc. — olive solution; on dilution — blue precipitate

74160:1

(Greenish blue) is the nickel compound obtained from C.I. Ingrain Blue 14, C.I. 74161:1

74160:2

(Blue) is the cobalt compound obtained from C.I. Ingrain Blue 5, C.I. 74161:2

74161 C.I. Ingrain Blue 13 (Bright blue)

Alternative precursor for **C.I. 74160**; a preformed polyisoindoline copper complex which requires reduction after application—F. Gund, *J.S.D.C.*, **76** (1960) 151–158

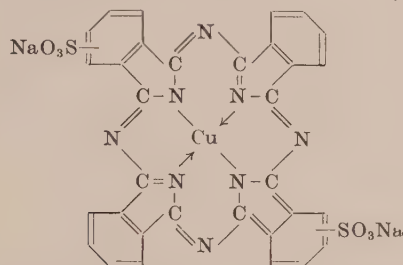
74161:1 C.I. Ingrain Blue 14 (Greenish blue)

A polyisoindoline nickel complex, precursor for **C.I. 74160:1**

74161:2 C.I. Ingrain Blue 5 (Blue)

A polyisoindoline cobalt complex with basic properties, soluble in organic acid solutions, precursor for **C.I. 74160:2**

74180 C.I. Direct Blue 86 (Bright greenish blue)



(Sulfonic acid groups in the 3-positions)

Disulfonate copper phthalocyanine by heating with oleum at 50–60°C for 10–15 hr.

Discoverers — Dandridge, Drescher and Thomas 1928

Scottish Dyes, *BP* 322169

I.G., *BP* 457796; *USP* 2099689; *GP* 663003 (*Fr.* **25**, 600)

BIOS 960, 56 { Siriuslichttürkisblau GL

{ Heliogenblau SBL

FIAT 1313, III, 305 { Sirius Light Turquoise Blue G

{ Heliogen Blue CL or SBL

Haddock, *Research*, **1** (1948), 685

Struve, Allen, *Lubs*, 609, 659

H₂SO₄ conc. — yellowish green; on dilution — greenish blue with bluish green precipitate

74180:1 (C.I. Pigment Blue 17) is the barium salt

74200 C.I. Direct Blue 87 (Bright greenish blue)
C.I. Pigment Blue 17 (Barium salt —
Bright greenish blue)

Trisulfonated copper phthalocyanine — sulfonic acid groups in the 3-positions

Trisulfonate copper phthalocyanine by heating with 40% oleum at above 60°C

Superior to disulfonated copper phthalocyanine in fastness to rubbing but inferior in fastness to washing

Discoverers — Dandridge, Drescher and Thomas 1928

Scottish Dyes, *BP* 322169

I.G., *BP* 457796; *USP* 2099689; *GP* 663003 (*Fr.* **25**, 600)

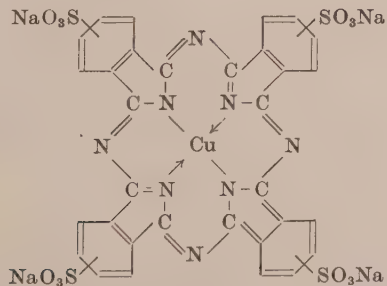
FIAT 1313, III, 305 — Heliogen Blue SBP

Haddock, *Research*, **1** (1948), 685

Struve, Allen, *Lubs*, 609, 659

H₂SO₄ conc. — green; on dilution — greenish blue with olive green precipitate

74220 C.I. Acid Blue 249



(Sulfonic acid groups in the 4-positions)

Use 4-sulfophthalic acid to make the phthalocyanine by method (2) cited under **C.I. 74160**. Superior to directly sulfonated copper phthalocyanine in fastness to light and alkali but inferior in affinity for cellulose; yields bluer dyeings

Discoverers — Harrison and Samuels 1935

I.C.I., *FP* 807052

FIAT 1313, III, 305 — Heliogen Blue S4

Haddock, *Research*, **1** (1948), 685

Struve, Allen, *Lubs*, 609, 659

Soluble in water (blue)

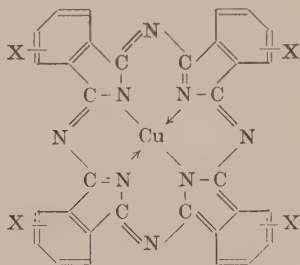
H₂SO₄ conc. — yellow green

HCl conc. — green with precipitate

HNO₃ conc. — decomposes

NaOCl — greenish red

Na₂S₂O₄ alkaline — brownish red

74240 C.I. Ingrain Blue 1 (Bright greenish blue)

X = an onium group, e.g. $-\text{CH}_2\text{S}^+\text{C}(\text{NR}_2)_2 \text{Cl}^-$ (R = alkyl or aryl)
 during dyeing these groups split off

Chloromethylate copper phthalocyanine and treat with a thiourea

Discoverers — Haddock and Wood 1944

I.C.I., BP 586340, 587636

Baddiley, *Review Textile Progress*, **1** (1949), 217

Fitzsimmons, Merker & Singleterry, *Ind. Eng. Chem.* **44** (1952), 557

Haddock, *Research*, **1** (1948), 685

Struve, *Lubs*, 618

H₂SO₄ conc. — green solution; on dilution — blue green solution

74250 C.I. Pigment Blue 15 (Bright blue)

Monochloro copper phthalocyanine

(1) Convert phthalonitrile to monochloro copper phthalocyanine, using cupric chloride in method (1) cited under C.I.74160

(2) Synthesise monochloro copper phthalocyanine by method (2) cited under C.I.74160, using a mixture of phthalic anhydride (3 mol.) and chlorophthalic acid (1 mol.). Used mainly in paints and lacquers

Properties similar to those of C.I.74160 but greener and stable to crystal growth in organic solvents

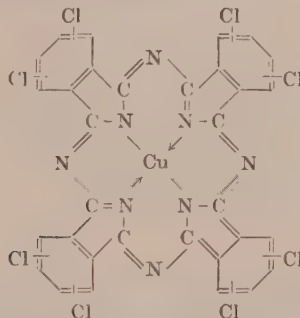
Discoverer — Linstead 1936

I.C.I., USP 2129013

Bigelow & Perkins, *Lubs*, 579, 597

74255 C.I. Pigment Green 37 (Bluish green)

Octachloro copper phthalocyanine



Convert dichlorophthalic acid (or anhydride) to octachloro copper phthalocyanine by method (2) cited under C.I.74160

Discoverer — Wyler 1935

I.C.I., BP 464126

I.G., USP 2276860; GP 717164, 740053, (Fr.-Bayer, I-2, 834, 838)

H₂SO₄ conc. — olive solution; on dilution — blue green precipitate

74260 C.I. Pigment Green 7 (Bright green)

Polychloro copper phthalocyanine containing 15 or 16 Cl atoms in the molecule

(1) Chlorinate copper phthalocyanine with chlorine in a eutectic mixture of NaCl and AlCl₃ at 180–200°C with FeCl₃ or CuCl₂ as catalyst, or in molten phthalic anhydride, or suspended in a "fluidised bed" at 180–200°C

(2) Heat copper phthalocyanine in sulfur dichloride under pressure at 150–175°C

(3) Convert tetrachlorophthalic anhydride to hexadecachloro copper phthalocyanine—USP 2549842

Most commercial products average 15 chlorine atoms per molecule whereas that made by method (3) contains 16 atoms (SUC brand)

Discoverers — Linstead and Dent 1935

I.C.I., BP 461268, 478256; USP 2214469, 2195984

I.G., BP 474740; USP 2276860; GP 717164, 740053, (Fr.-Bayer, I-2, 834, 838)

Du Pont, USP 2247725, 2377685, 2586598

Standard Ultramarine Co., USP 2549842

BIOS 960, 49 — Heliogengruen G

FIAT 1313, III, 285–291

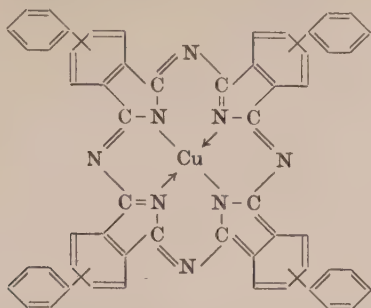
Haddock, *JSDC*, **61** (1948), 68

Bigelow & Perkins, Allen, *Lubs*, 598, 658

H₂SO₄ conc. — olive solution; on dilution — green precipitate

74280 C.I. Ingrain Green 3 (Green)

The diiminoisindoline precursor for tetraphenyl copper phthalocyanine



Sulfonate 4-biphenylamine, convert by a Sandmeyer reaction to 4-cyano-3-biphenylsulfonic acid, fuse with potassium sodium ferrocyanide to 3,4-biphenyldicarbonitrile (FIAT 1313, III, 312, 313) and convert to the copper phthalocyanine derivative — BP 470542

Discoverers — Bienert and Gassner 1935

I.G., BP 470542; USP 2213517; GP 682542 (Fr.-Bayer, I-2, 822)

FIAT 1313, III, 311 — Heliogen Green B

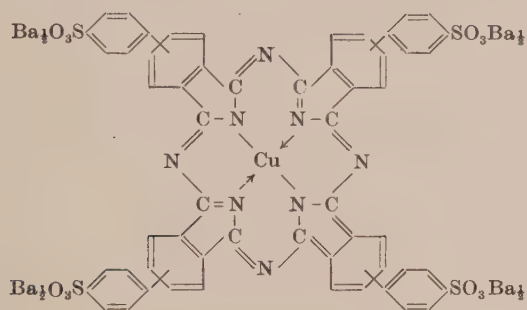
Bigelow & Perkins, Lubs, 600

F. Gund, J.S.D.C., 76 (1960) 151-158

H₂SO₄ conc. — green solution; on dilution — green suspension

74300 Pigment (Bluish green)

Barium salt of tetrasulfonated tetraphenyl copper phthalocyanine



Tetrasulfonate C.I.74280 or convert sulfonated 3,4-biphenyldicarbonitrile to tetrakis(sulfophenyl) copper phthalocyanine

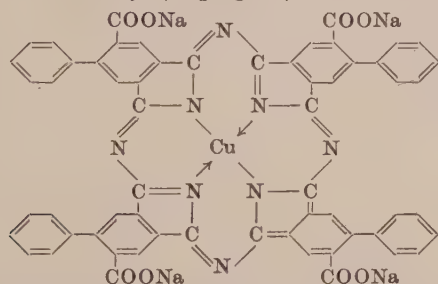
Discoverers — Bienert and Gassner 1935

Heliogen Green SBL (IG)

Usage — Wallpaper printing

I.G., BP 491151; USP 2280507

FIAT 1313, III, 313 — Heliogen Green SBL

74320 Direct Dye (Bright green)

Add cinnamic acid to 2,3-dimethyl-1,3-butadiene by a Diels-Alder reaction, dehydrogenate and oxidise to 2,4,5-biphenyltricarboxylic acid and then fuse with urea, cupric chloride and ammonium molybdate as catalyst

Discoverers — Hoyer, Schroeter and Rinke 1937

Sirius Supra Green FFGL (IG)

Similar in general properties to C.I.74180 (C.I. Direct Blue 86), dyeing cellulose bright yellowish green, but somewhat faster to washing and light. Very sensitive to hard water and should be mixed with an alkali metal phosphate before being dissolved in water

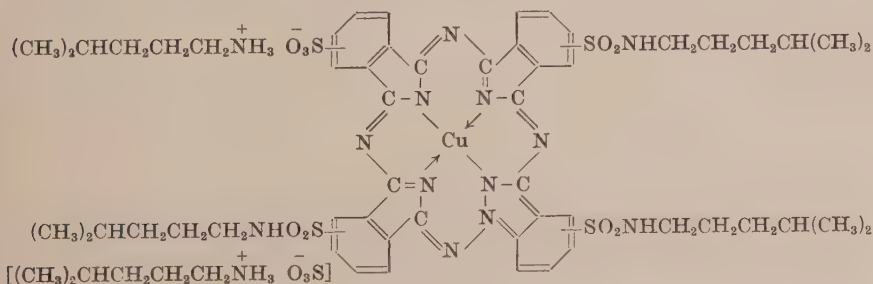
I.G., BP 496819; USP 2242469; FP 838602

FIAT 1313, III, 315 — Sirius Supra Light Green FFGL

Struve, Lubs, 613

Soluble in water

H₂SO₄ conc. — green solution; on dilution — green suspension

74350 C.I. Solvent Blue 25 (Greenish blue)

(Substituents in the 3-positions)

Convert copper phthalocyanine to its tetrasulfonyl chloride with chlorosulfonic acid, then treat with isohexylamine (some hydrolysis to sulfonic acid occurs)

Discoverers — Nadler, Hoyer and O. Bayer 1937

I.G., BP 520199; GP 696591 (Fr.-Bayer, I-2, 902); GP applic. J58204

BIOS 960, 60 — Zaponechtblau HFL

FIAT 1313, III, 318 — Zapon Fast Blue HFL

Struve, Lubs, 611

Soluble in hydrocarbons and alcohols

74380 C.I. Solvent Blue 24 (Greenish blue)

Treat highly sulfonated copper phthalocyanine first with dimethylamine and then with palmitic acid

Discoverer — I.G. 1936

FIAT 1313, III, 318 — Zapon Fast Blue HL

FDX 885, — Zaponechtblau HL

Struve, *Lubs*, 612

Soluble in hydrocarbons

74400 C.I. Solvent Blue 55

Treat copper phthalocyanine polysulfonyl chloride with isoundecylamine under conditions where partly amide and partly amine salt formation occurs in a ratio of 2-3:1

Discoverer — I.G.

Zapon Fast Blue FLT (IG)

FIAT 1313, III, 318 — Zapon Fast Blue FLT

74420 Solvent Dye

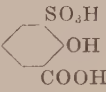
Condense copper phthalocyanine tetra(or tri)sulfonyl chloride with branched-chain aliphatic amines prepared from C₇-C₉ fatty acids

Discoverer — I.G.

New Zapon Blue (IG)

FIAT 1313, III, 319 — New Zapon Blue

74440 Mordant Dye

Copper phthalocyanine substituted by 1 or 2 -SO₂NH- and 2 or 3 sulfonic acid radicals

Treat copper phthalocyanine tetrasulfonyl chloride with 5-amino-3-sulfosalicylic acid (some hydrolysis to sulfonic acid occurs)

Discoverers — Nadler, Hoyer and O. Bayer 1937

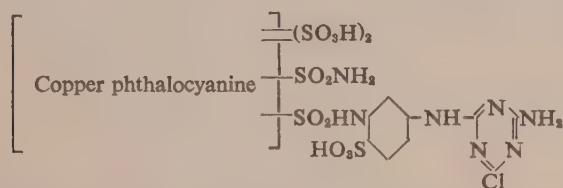
Chrome Turquoise Blue B (IG)

Printed with chromium acetate on viscose rayon yields prints of excellent fastness to light and moderate fastness to washing

FIAT 1313, III, 327 — Chrome Turquoise Blue B

FDX 885 — Chromturkisblau 21241

cf. I.G., BP 520199; GP 696591 (*Fr.-Bayer*, I-2, 902)

74460 C.I. Reactive Blue 7

Panchartek, Allan and Mužik, *Coll. Czech. Chem. Commun.*, 25 (1960) 2783-2799

French Pat. 1,181,149

NOTES

NATURAL ORGANIC COLOURING MATTERS

This section deals only with those compounds which form the coloured components of those coloured organic materials of animal or vegetable origin which either have been or are used as dyes or pigments. The numerous coloured materials of animal or vegetable origin, which have never found commercial use as dyes or pigments, e.g. most flower and fruit pigments and the physiologically important bile pigments, have been excluded from this *Index*.

The natural organic dyes and pigments cover a wide range of chemical classes. They are given here as a single class but they are arranged in the same chemical order in which the various chemical classes of synthetic organic dyes are placed in this *Index* viz. polymethine, ketone imine, quinones of semi-xanthene type, hydroxyketones, anthraquinonoids, naphthoquinones, flavones, flavanols, flavanones, indigoids and chlorophyll.

Many of the compounds listed in this section are present in more than one natural dye or pigment and so have more than one Part I reference given for them, these references being placed in the order of importance which that particular compound plays as a component of the dyes concerned.

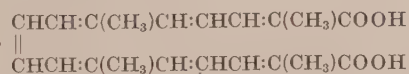
The literature on the constitution of the components of natural dyes and pigments is extremely voluminous. Most comprehensive bibliographies for many of the compounds are given in the two standard books on this subject (see 11 and 13 below); as no worker in this field can afford not to consult those books, references given in them are not repeated in this *Index*.

Literature

- 1 Baker, W., *Plant Pigments* in *Thorpe's Dictionary of Applied Chemistry*, 4th Ed., Vol. 10, pp. 1-13 (London, 1950)
- 2 Bhattacharya, B. C., Pal, P., and Das, A. T., *Indigenous Vegetable Colouring Matters*, Govt. of W. Bengal, Directorate of Industries, Bull. No. 133 (Alipore, W. Bengal, 1951)
- 3 Bielig, H.-J., *Naturfarbstoffe I* in *FIAT Review of German Science 1939-46; Biochemistry*, Part I, p. 67
- 4 Davenport, E. G., *Your Yarn Dyeing* (London, 1955) contains chapters on *Native Plants which yield Dye* and on *Dyestuffs from Cultivated Plants*
- 5 Fischer, H., and von Dobeneck, H., *Porphyrinsynthesen, Pentdyopent* in *FIAT Review of German Science 1939-46, Biochemistry, Part I, Naturfarbstoffe II*, p. 129
- 6 Fischer, H., and Siedel, W., *Pyrrrolsynthesen und Gallenfarbstoffe*, *ibid.*, p. 109
- 7 Fischer, H., and Strell, M., *Chlorophyll*, *ibid.*, p. 141
- 8 Leechman, D., *Vegetable Dyes from North American Plants* (Toronto, Oxford University Press, 1943)
- 9 Leggett, W., *Ancient and Medieval Dyes* (New York, 1944)
- 10 Mairet, E. M., *A Book of Vegetable Dyes*, 9th printing (London, 1946)
- 11 Mayer, F., *The Chemistry of Natural Colouring Matters*, 3rd Ed. Translated and Revised by A. H. Cook (New York, 1943)
- 12 Paris, R., *Produits pharm.*, 6 (1951), 543-9, 606-613. Review of the occurrence, extraction, physical and chemical properties, and analysis of the flavone pigments; 111 references
- 13 Perkin, A. G., and Everest, A. E., *The Natural Organic Colouring Matters* (London, 1918)
- 14 Phadke, B. N., *History of Dyes and Dyeing in the Bombay Presidency* (Poona, 1950)
- 15 Thomson, R. H., *Naturally Occurring Quinones*, London (Butterworths, 1957). A comprehensive account of naturally-occurring quinone pigments

75100 C.I. Natural Yellow 6, 19 C.I. Natural Red 1

Common name **Crocin**



P & E, 602
Mayer & Cook, 71, 79
Cross, Thorpe, X, 655

(1) Occurs in Saffron and Wongsby, C.I. Natural Yellow 6, as crocin, the digentobiose ester of crocetin. Crocin is readily soluble in water and readily hydrolysed by dilute alkali

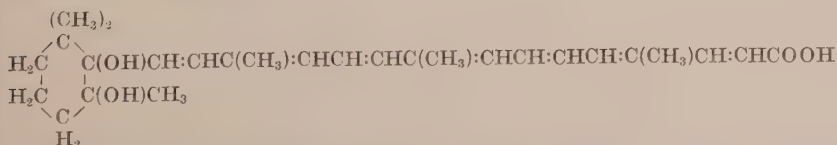
(2) Is one of the pigments present in Toon flowers, C.I. Natural Red 1. Crocetin dyes dull orange on an aluminium and dull yellow on a tin mordant

Aqueous alkaline solution — orange red. Readily soluble in alcohol
 H_2SO_4 conc. — deep blue

75110 C.I. Natural Orange 3

Mayer & Cook, 86

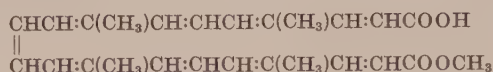
Common name **Azafrin**



Occurs in the roots and shoots of *Scrophulariaceae Escobedia scabrifolia* and *S. E. linearis* native to tropical America

Soluble in alcohol
Ethereal solution + HCl gives a deep violet acid layer

Common name **Bixin**

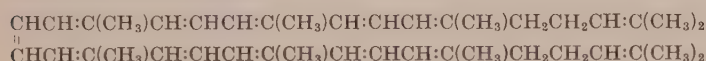


The seeds and pulp of the shrub *Bixa orellana*, are macerated with water, allowed to ferment, sieved and the Annatto, which settles out, is dried in the sun into cakes containing 6–12% colouring matter and not more than 5% ash, the amount of dye present depending upon the origin of the Annatto. Bixin is a direct dye for both animal and vegetable fibres, yielding orange-reds to yellowish orange, its alum, chrome and tin lakes are orange, greenish yellow and lemon yellow respectively. At least six other colorants are present in Annatto, one being probably ϵ carotene

P & E, 609
Mayer & Cook, 79, 82
Thorpe, **I**, 378
 Boussingault, *Ann. Chim. Phys.* **28** (1825) (2), 440
 Preisser, *Ann.* **52** (1844), 382
 Kerndt, *Jahresber.* (1849), 457
 Bolley & Mylius, *J. pr. Ch.* **93** (1864) (1), 359
 Stein, *ibid.* **102** (1867) (1), 175
 Etti, *Ber.* **7** (1874), 446; **11** (1878), 864
 Marchlewski & Matejko, *Anz. Akad. Wiss. Krakau* (1905), 745
 Perkin, *JCS*, **101** (1912), 1539
 Faltis & Vieböck, *Ber.* **62** (1929), 701
 Kuhn & Winterstein, *Helv. Chim. Acta*, **11** (1928), 427; **12** (1924), 904
 Diemar & Heusser, *Z. Lebensm.-Untersuch. u. Forsch.*, **97** (1953), 289
Osteras and Olsen, Chem. and Ind., 23 (1967) 952 and
Dutch P 199878

Soluble in aqueous alkali and chloroform, slightly soluble in cold and very soluble in hot alcohol
 H₂SO₄ conc. — cornflower blue; on dilution — dark blue

Common name **Lycopene**

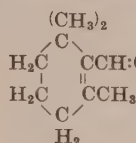


The principal pigment present in the flowers of the marigold, *Calendula officinalis*, it also occurs in many other plants and in some species of bacteria. Distinguished from the isomeric carotene, C.I.75130, by its bluish red solution in carbon disulfide

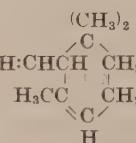
Discoverer — Millardet
Mayer & Cook, 20

Soluble in hydrocarbons

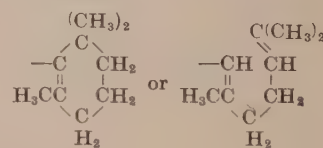
75130 C.I. Natural Yellow 26
C.I. Natural Brown 5



α -Carotene



β - and γ -Carotene differ only in the end nucleus respectively

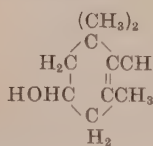


Widely distributed throughout the vegetable and animal kingdoms and in several isomeric forms. The β -form sometimes occurs alone but the α - and γ -forms are always accompanied by the β -form. The average composition of carotene preparations is 15% α , 85% β and 0.1% γ , but varies considerably depending on the plant it is obtained from.

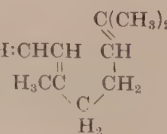
Discoverer — Wackenroder 1831
Procter & Gamble Co., *USP* 2484040
U.S. Secretary of Agriculture, *USP* 2527602
Colgate-Palmolive-Peet Co., *USP* 2572467
Mayer & Cook, 25
Baker, *Thorpe*, **X**, 1
Karrer, *Fortschr. Chem. org. Naturstoffe*, **5** (1949), 1
Inhoffen & Bohlmann, *ibid.* 175
Hunter, *Research*, **3** (1950), 453
Inhoffen, Bohlmann, Bartram & Pommer, *Chem. Z.* **74** (1950), 285
Karrer & Eugster, *Compt. rend.* **230** (1950), 1921; *Helv. Chim. Acta*, **33** (1950), 1952
Inhoffen, Bohlmann, Aldag, Bork & Leibner, *Ann.* **573** (1951), 1
Judah, Burdick & Carrol, *Ind. Eng. Chem.* **46** (1954), 2263

75135 C.I. Natural Yellow 27

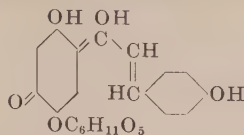
Common name **Rubixanthin**



Present in the flowers of the marigold, *Calendula officinalis*. Its solution in petroleum has an absorption spectrum like that of γ -carotene, C.I.75130



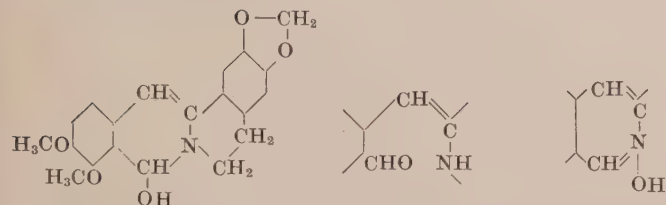
Discoverer — Winterstein
Mayer & Cook, 48
Soluble in hydrocarbons

75140 C.I. Natural Red 26Common name **Carthamin** or **carthamic acid**

The petals of the Dyers Thistle, *Carthamus tinctorius*, are extracted with water to remove the Safflower Yellow, C.I. Natural Yellow 5 (constitution unknown), and then extracted with soda lye from which the carthamin is precipitated with acid. Dyes cotton and silk pink from an alkaline bath on gradual acidification

Bersch, *The Manufacture of Mineral and Lake Pigments*, trans. by A. C. Wright (London 1901), 366
P & E, 594
Mayer & Cook, 208
Phadke, 120
 Kemetaka, *J. Chem. Soc. Tokyo*, **27** (1906), 1202
 Kuroda, *JCS*, (1930), 732, 765
 Cross, *Thorpe*, **X**, 653

Orange solution in alkali and alcohol
 H_2SO_4 conc. — dull red

75160 C.I. Natural Yellow 18Common name **Berberine**

Carbinol form

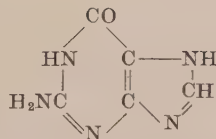
Aldehyde form

Ammonium form

Berberine base is unstable and assumes the aldehyde form but its salts are derived from the ammonium form. Present in many plants, e.g. in the stem and roots of Barberry, *Berberis vulgaris*. It is the only known natural basic dye

P & E, 567
Mayer & Cook, 317

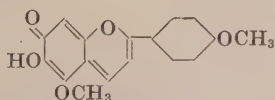
Soluble in hot water
 H_2SO_4 conc. — yellow; on warming — olive green
 HCl conc. — intense yellow
 Aqueous solution + chlorine water — bright red

75170 C.I. Natural White 1Common name **Guanine**

Widely distributed in animal and vegetable tissues but commercially obtained from fish scales and swimming bladders and from guano. The raw material is heated for a little while at 65–100°C then suspended in white spirit and the mucous material separated from the suspended guanine crystals. Used for pearly or lustrous effects

Discoverer — Jacquin, late seventeenth century
 Merck, *GP* 158591 (*Fr.* **7**, 663), 162236 (*Fr.* **8**, 1145)
 Buitelaar, *BP* 645803
Thorpe, **VI**, 150
 Fischer, *Ber.* **30** (1897), 2251
 Levene, *Biochem. J.* **41** (1907), 320
 Hoppe-Seyler & Schmidt, *Z. physiol. Chem.*, **175** (1928), 304
 Obata, Igarashi & Ishida, *Bull. Japan Sci. Fisheries*, **16** (1950) 141
 Krajekman, *Paint*, **22** (1952), 387 (30 references)
 Groen, *Paint, Oil & Col. J.* **124** (1953), 602
 Pearl Essence. References 1939–1954. *Science Library Bibliographical Series No. 735. Supplement to No. 696*, London (1955)

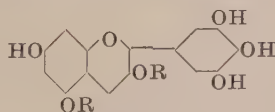
Soluble in acids and alkalis
 Warm dilute solution in HCl + saturated aqueous picric acid — orange red ppt.

75180 C.I. Natural Orange 5Common name **Carajurin**

The leaves of *Bignonia chica* Humb. and Bonpl. grown in tropical America are fermented in water until a dark red precipitate settles out

P & E, 342
Mayer & Cook, 202
 Erdmann, *Jahresber.* (1857), 487
 Lee, *JCS*, **79** (1901), 284

Soluble in dilute aqueous caustic alkali, alcohol, oils and fats
 $\text{Na}_2\text{S}_2\text{O}_4$, alkaline — violet, reoxidising immediately to brown on exposure to air, but if poured into dilute HCl a fine pure red ppt. settles out

75190 C.I. Natural Blue 3Common name **Awobanin A** or **Delphidin-3,5-diglucoside**

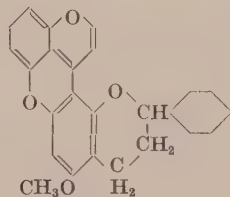
The chief component of the colouring matter of the Japanese flower "Tsuyukusa", *Commelina communis* var. *hortensis* Makino, used in making awobana paper

P & E, 302
Mayer & Cook, 228

75200 C.I. Natural Red 31

Mayer & Cook, 257

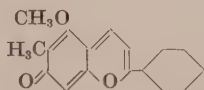
FIAT 96

Collins, Haworth, Isarasena & Robertson, *JCS*, (1950), 1876
Robertson, Whalley & Yates, *ibid.* 3117Common name **Dracorubin**

A component of the resinous secretion found on the fruits of *Daemonorops propinquus*, *D. Draco Blume*, *Dracaena Draco*, etc. occurring in Sumatra and Borneo

75210 C.I. Natural Red 31

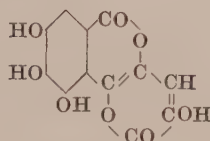
FIAT 95

Robertson & Whalley, *JCS*, (1950), 1882Common name **Dracorhodin**

With Dracorubin, C.I.75200, in Dragons Blood

75220 Natural Dye

Discoverer — Bohn 1886

Badische Co., BP 6413/86; USP 348613; FP 175835; GP 37934
(Fr. 1, 567)Knecht, *JSDC*, 2 (1886), 154Bohn & Graebe, *Ber.* 20 (1887), 2327Perkin, *JCS*, 75 (1899), 442Herzig & Tscherne, *Monatsh.* 25 (1904), 603; 29 (1908), 281;
Ann. 351 (1907), 24Herzig, Erdös & Ruzicka, *Monatsh.* 31 (1910), 799Herzig, *Ann.* 421 (1920), 247Haworth & McLachlan, *JCS*, (1952), 1583Common name **Galloflavin**

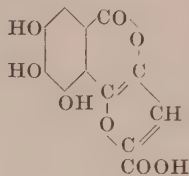
Together with isogalloflavin, C.I.75230, obtained by aerating aqueous sodium gallate. **Galloflavine W (B)** dyed chromed wool olive yellow, fast to light, milling, washing, acids and alkalis; it was also used for printing chrome mordanted cotton a greenish yellow which was rather sensitive to chlorine. For synthesis see C.I.55010

Slightly soluble in water, alcohol and ether; soluble in acetic acid and aniline

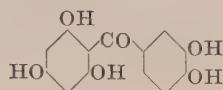
H₂SO₄ conc. — reddish yellow; on dilution — white ppt.

75230 Natural Dye

Literature — see C.I.75220

Common name **Isogalloflavin**

Together with galloflavin, C.I.75220, by aeration of aqueous sodium gallate

75240 C.I. Natural Yellow 11Common name **Maclurin**

Together with morin in the wood of the Dyer's Mulberry, *Chlorophora tinctoria* Gard. found in N., S., and Central America, W. Indies, etc. Dyes pale yellow, yellowish green or pale grey on alum, chrome or iron mordants respectively. Formerly used as an intermediate in the manufacture of **Patent Fustine** (YDC), C.I.20030*

P & E, 115

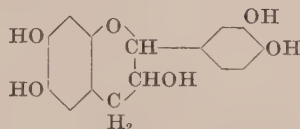
Mayer & Cook, 187

See also Morin C.I.75660

Slightly soluble in hot water, soluble in NaOH

 H_2SO_4 conc. — yellow

The colourless aqueous solution gives dark green with FeCl_3 , yellow ppt. soluble in acetic acid with lead acetate and a ppt. with tannic acid

75250 C.I. Natural Brown 3Common name **Catechin**

Catechin has two racemic and four optical forms—*d*-, *l*- and *r*-catechin and *d*-, *l*- and *r*-epicatechin. In catechin and epicatechin, the H and OH in the 2,3-positions have *trans* and *cis* configurations respectively

The colouring matter in all the cutches, catechus, etc. Hummel and Brown say that during dyeing catechin is converted to catechu tannic acid which is then oxidised to a brown product of unknown constitution which is fixed on the fibre. Yields pale yellow on an alum and brown on an iron mordant

Discoverer — Nees van Esenbeck 1832

P & E, 463

Mayer & Cook, 198

Thorpe, **II**, 433van Esenbeck, *Ann.* **1** (1832), 243Svanberg, *Pogg. Ann.* **39** (1836), 161; *Ann.* **24** (1837), 215Wackenroder, *Ann.* **31** (1839), 72; **37** (1841), 306Zwenger, *Ann.* **37** (1841), 336Neubauer, *Ann.* **96** (1855), 337Strecker, *Ann.* **118** (1861), 285Kraut & van Delden, *Ann.* **128** (1863), 285Hlasiwetz, *Ann.* **134** (1865), 118Löwe, *Z. anal. Chem.* **12** (1873), 285Cazeneuve, *Ber.* **8** (1875), 828Wesselsky, *Ber.* **9** (1876), 217Gautier, *Compt. rend.* **85** (1887), 342752; **86** (1878), 668Etti, *Ann.* **186** (1877), 327; *Monatsh.* **2** (1881), 547Miller, *Ann.* **220** (1883), 115*JSDC*, **1** (1885), 94*Indian Pharmacologist*, **1** (1896), 88Hummel & Brown, *JSCI*, **15** (1896), 422Perkin, *JCS*, **71** (1897), 1135; **87** (1905), 398Karnowski & Tambor, *Ber.* **35** (1902), 2408von Kostanecki & Krembs, *ibid.* 2410von Kostanecki & Lampe, *Ber.* **40** (1907), 4910

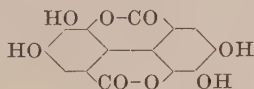
Nierenstein, *JCS*, **117** (1920), 971, 1151; **119** (1921), 164; *Ber.* **56** (1923), 1877; *JACS*, **52** (1930), 1672; *J. Indian Chem. Soc.* **7** (1930), 279

Freudenberg et al., *Ber.* **54**[B], (1921), 1204; **55**[B] (1922), 1734; **56** (1923), 1185; *Ann.* **436** (1924), 286; **437** (1924), 274; **442** (1925), 309; **444** (1925), 135

Mason, *JSCI*, (1928), T269Baker, *JCS*, (1929), 1593; Thorpe, **X**, 11Drumm, Cawlar & Ryan, *Proc. Roy. Irish Acad.* **39B** (1929), 114

Slightly soluble in cold and soluble in hot water

Lead acetate — colourless ppt.

 FeCl_3 — dark green or dark violet in presence of sodium acetate**75270 Natural Dye**Common name **Ellagic acid**

Boil the aqueous extract of divi-divi, myrobalans or other tannins containing ellagitannin with dilute sulfuric acid or oxidise gallic acid with potassium persulfate and sulfuric acid in acetic acid solution. Formerly used for dyeing fast yellows on chromed wool. For synthesis see C.I.55005*

Discoverer — Chevreul 1828

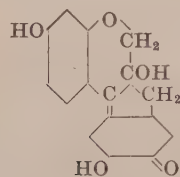
P & E, 399

Mayer & Cook, 200

Chevreul, *Ann. Chim. Phys.* **9** (2) (1828), 329Braconnet, *ibid.* 187Pélouze, *ibid.* **54**, 536Merklein & Wöhler, *Ann. Chem. Pharm.* **55** (1845), 129Rembold, *Ann.* **143** (1867), 288; *Ber.* **8** (1875), 1494Löwe, *Z. für Chem.* **4** (1868), 653; *Z. für anal. Chem.* **14** (1876), 40Ernst & Zwenger, *Ann.* **159** (1871), 32Griessmayer, *ibid.* **160**, 55Barth & Goldschmidt, *Ber.* **11** (1878), 846; **12** (1879), 1237Schiff, *ibid.* 1535Etti, *Monatsh.* **1** (1880), 226Strohmer, *ibid.* **2** (1881), 539Perkin & Gunnel, *JCS*, **69** (1896), 1307Perkin, *JCS*, **71** (1897), 1137; **77** (1900), 424; **89** (1906), 259Perkin & Wilson, *JCS*, **83** (1903), 134Graebe, *Ber.* **36** (1903), 214Perkin & Nierenstein, *JCS*, **87** (1905), 1416Nierenstein, *Ber.* **40** (1907), 917; **41** (1908), 3015; cf. **42** (1909), 353Merzig & Bronneck, *Monatsh.* **29** (1908), 263Goldsmiedt et al., *ibid.* 263Sisley, *Bull. Soc. chim.* **5** (4) (1909), 727Feist & Besthorn, *Arch. Pharm.* **263** (1925), 16Shinoda & Ping-ku, *J. Pharm. Soc. Japan*, **51** (1931), 50Zetsche & Graef, *Helv. Chim. Acta*, **14** (1931), 240

Slightly soluble in boiling water

The yellow alkaline solution turns green on addition of FeCl_3

75280 C.I. Natural Red 24Common name **Brazilein**

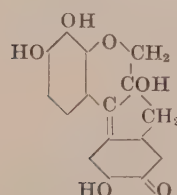
Occurs as brazilin in the wood of various species of *Caesalpinia*; during dyeing it oxidises to brazilein

Discoverer — Brazilin was first isolated by Chevreul in 1808
P & E, 346, 359
Mayer & Cook, 233
Thorpe, II, 67
 Chevreul, *Ann. Chim. Phys.* **66** (1808), 225
 Preisser, *Ann.* **52** (1844), 369
 Benedikt, *Ann.* **178** (1875), 100
 Buchka, *Ber.* **17** (1884), 685
 Perkin, *JCS*, **75** (1899), 443
 Herzig & Pollak, *Monatsh.* **22** (1901), 207
 Mayer, *Z. wiss. Mikros.* **20** (1904), 409
 Werner & Pfeiffer, *Chem. Z.* **3** (1904), 390, 420
 Morgan, *JSDC*, **37** (1921), 46
 Wilson & Bennett, *Analyst*, **53** (1928), 454

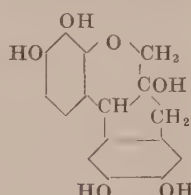
Brazilein is slightly soluble and brazilin soluble in water
 Brazilein: NaOH 10% — deep red turning brown in air
 Brazilin: NaOH 10% — colourless then deep red as it oxidises to brazilein

75290 C.I. Natural Black 1 and 2

Common names —

Hæmatin**Hæmatoxylin**

(leuco compound of hæmatin)



Occurs in the heartwood of *Hæmatoxylin campechianum* L., a tree growing in Mexico, Haiti, San Domingo, Cuba, British Honduras, Mauritius, etc. The extracts are got by boiling with water (French process) or treating with 15–30 lb. steam (American process) and then concentrating under vacuum or evaporating to get the crystals or solid extract. If oxidised products are required, the extract is oxidised before drying. Logwood extracts may be unoxidised or oxidised to varying degrees, the hæmatin content varying from 20–100% of the total colouring matter present

Discoverer — Hæmatoxylin was first isolated by Chevreul in 1812
 Avery, *BP* 7630/85
P & E, 345, 363, 375
Mayer & Cook, 241
Thorpe, VII, 378
 Lemberg & Legge, *Hæmatin Compounds and Bile Pigments*, New York (1949)
 Chevreul, *Ann. Chim. Phys.* **82** (ii) (1812), 53, 126
 Schützenberger & Paraf, *Bull. Soc. Ind. Mulhouse*, **21** (1861), 511
 Benedikt, *Ann.* **178** (1875), 98
 Halberstadt & von Reis, *Ber.* **14** (1881), 611
 Hummel & Perkin, *Ber.* **15** (1882), 2337
 Soxhlet, *JSDC*, **6** (1890), 98
 Foelsing, *ibid.* **9** (1893), 40
 Herzig, *Monatsh.* **19** (1898), 738
 Whitaker & Denison, *JSDC*, **11** (1895), 74
 Austen, *ibid.* 125, 195
 Pfeiffer, *Chem. Z.* **3** (1904), 380
 Mayer, *Z. wiss. Mikros.* **20** (1904), 409
 Gruenberg & Gies, *JSDC*, **21** (1905), 44
 Perkin & Robinson, *JCS*, **93** (1908), 1115
 Perkin, *JSDC*, **34** (1918), 99
 Savini, *Ann. Chim. Appl.* **10** (1918), 28
 Houseman & Swift, *J. Ind. Eng. Chem.* **12** (1920), 173
 Morgan, *JSDC*, **37** (1921), 46
 Crabtree & Robinson, *JCS*, **121** (1922), 1033
 Perkin, Ray & Robinson, *JCS*, (1927), 2094
 Pfeiffer & Oberlin, *Ber.* **60** (1927), 2142
 Perkin, Pollard & Robinson, *JCS*, (1937), 49
 Pfeiffer et al, *J. pr. Chem.* **150** (1938), 199; **154** (1940), 157
 Lea, *JSCI*, **63** (1944), 107
 Duff, *Dyer*, **103** (1950), 271
 Newsome, *ibid.* **104** (1950), 625
 Tisdale, *Am. Dy. Rep.* **46** (1954), 157
 Arshid et al, *JSDC*, **70** (1954), 392, 402

Hæmatoxylin is slightly soluble in cold and fairly soluble in hot water;
 hæmatin is slightly soluble in hot water

Hæmatin H_2SO_4 conc. — deep red
 NaOH — deep violet

75291 C.I. Natural Black 3 and 4

Aluminium, chromium, iron or tin lakes of hæmatin or their solutions in aqueous sodium bisulfite

Logwood lakes vary from bluish black to black but very deep blacks are obtainable. Purple to black lakes may be got by boiling logwood extract with iron or chromium in presence of an oxidising agent, usually potassium dichromate, on a base of aluminium hydroxide

Bronze Lake

(a) Precipitate logwood extract with $\text{Al}_2(\text{SO}_4)_3$ and then $\text{K}_2\text{Cr}_2\text{O}_7$ and after 12–15 hr. neutralise with chalk or soda

(b) Treat cold logwood extract with conc. H_2SO_4 and SnCl_4 and then hot $\text{K}_2\text{Cr}_2\text{O}_7$ and stir for 1 hr.

(c) Add SnCl_4 and KClO_3 to logwood extract, bring to 75°C and stand for one week with occasional stirring

Logwood Black

Stir logwood extract (1 part) with water (10) and H_2SO_4 , sp.gr. 1.84 (0.1), add $\text{K}_2\text{Cr}_2\text{O}_7$ (0.25) in water (0.5) and wash the ppt. repeatedly. A browner lake is produced if HCl is used instead of H_2SO_4

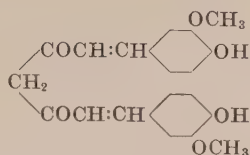
Noir réduit

Precipitate the lakes in acetic acid and then dissolve in aqueous NaHSO_3 , the hue may be varied by addition of Quercitron Bark Extract, C.I. Natural Yellow 10, or iron acetate

Steam Black

Precipitate cold logwood extract with iron nitrate or ferrous sulfate and ammonia and, after keeping for three days, repeatedly wash the black ppt. It needs only short steaming for fixation on cotton

Grandmougin, *Els. Textilblatt.* (1912), 1141
 Arshid et al, *JSDC*, **70** (1954), 402

75300 C.I. Natural Yellow 3Common name **Curcumin**

Occurs in the roots and shoots of *Curcuma tinctoria*, *C. longa*, *C. rotunda* and *C. vividiflora*, indigenous to tropical Asia and cultivated in China, Cochin China and the E. Indies. Dyes cotton, wool and silk directly greenish yellow and yields orange yellow on an alum, brown on a chrome, brownish black on an iron and orange red on a tin mordant

Temmler-Werke, GP 700765; 702500 (*Fr.-Bayer*, I-2, 1425)
FIAT 105

P & E, 388

Mayer & Cook, 93

Vogel, *Ann.* **44** (1842), 297; *Pharm. Zentr.* **13** (1842), 761

Schlumberger, *Bull. Soc. chim.* **5** (1866), 194

Bolley, Suida & Daube, *J. pr. Ch.* **103** (1868), 474

Iwanoff-Gajewsky, *Ber.* **5** (1872), 1103

Jackson & Menke, *Amer. Chem. J.* **6** (1884), 77

Perkin & Wilson, *JCS*, (1903), 83, 140

Leach, *JACS*, **26** (1904), 1210

Lampe, *Ber.* **51** (1918), 1347

Rebeiro, Kothape & Nadkarny, *J. Univ. Bombay*, Sect. A, **19**, Pt. 3 (Science, No. 28) (1950), 38

Slightly soluble in hot water

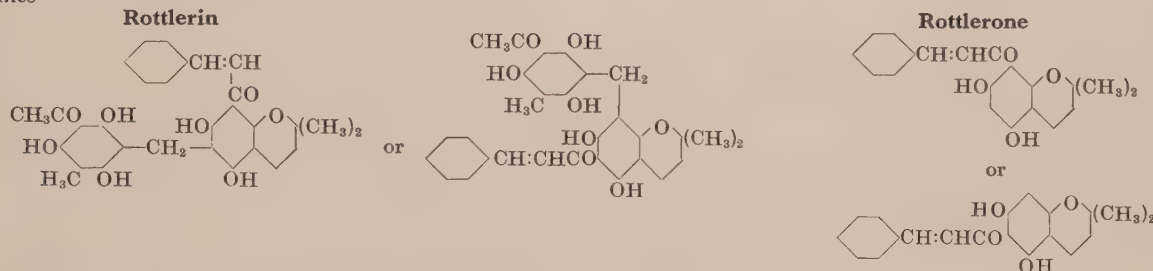
H₂SO₄ conc. — reddish brown; on dilution — colourless

HNO₃ conc. — deep red turning yellow

NaOH 10% — bright reddish orange

**75310 C.I. Natural Orange 2
C.I. Natural Yellow 25**

Common names —



Occurs as an orange-red powder found as a glandular excrescence on the fruits of *Mallotus philippinensis* Muell. (*Rottlera tinctoria* Roxb.) met with in tropical India, Ceylon, E. Indies, China and Australia. The ripe seed capsules are shaken until the powder separates. Rottlerin is decomposed by boiling alkalis and so the product ultimately fixed on the fibre is rottlerone

P & E, 599

Mayer & Cook, 204

Anderson, *Edin. New Phil. J.* **1** (1855), 296

Brockmann & Maier, *Ann.* **541** (1939), 53; *Naturwiss.* **27** (1939), 259

Baksi et al, *Current Sci.* **8** (1939), 165; **9** (1940), 136

Jalota, *J. Indian Chem. Soc.* **16** (1939), 405

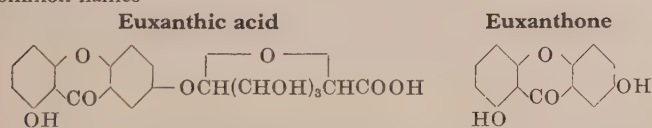
Backhouse & Robinson, *JCS*, (1939), 1257

Morton & Sawires, *JCS*, (1940), 1052

Soluble in alkali

75320 Natural Dye

Common names —



In **Indian Yellow**, **Pioury** or **Piuri**, **Purrea arabicu**, or **Purrée** obtained in Bengal by feeding cows on the leaves of the mango tree, *Mangifera indica* and heating their urine to precipitate the dye as the magnesium or calcium salt. Euxanthic acid readily breaks down into euxanthone and glycuronic acid both being found in the commercial product. Formerly used in India in paints; also used as an artists' pigment for oil and water colours

P & E, 127

Mayer & Cook, 246

Erdman, *J. pr. Ch.* **33** (1) (1844), 190; **37** (1) (1846), 385

Laurent, *Compt. rend.* **26** (1848), 33

Schmid, *Ann.* **93** (1855), 87

Graebe & Ebrard, *Ber.* **15** (1882), 1675

Spiegler, *Ber.* **15** (1882), 1964; **17** (1884), 807

Graebe, *Ber.* **16** (1883), 862; **20** (1887), 2331; **22** (1889), 1405

Graebe & Feer, *Ber.* **19** (1886), 2607

Dreher & von Kostanecki, *Ber.* **26** (1893), 71

Graebe, Aders & Heyer, *Ann.* **318** (1900), 345

Gorter, *Bull. Jard. bot. Buitenzorg.* **4** (1922), 260

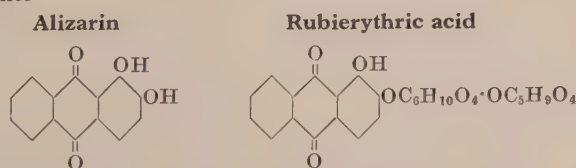
Wiechowski, *Arch. expt. Path. Pharm.* **97** (1923), 462

Robinson & Waters, *JCS*, (1929), 2239; (1931), 1709

Spoelstra & van Royen, *Rec. trav. chim.* **48** (1929), 370

75330 C.I. Natural Red 6, 8, 9, 10, 11, 12

Common names —



As the glucoside rubierythric acid, alizarin 2-β-primeveroside in madder, C.I. Natural Red 8, and chayroot, C.I. Natural Red 6, the root of *Hedyotis umbellata* L. grown in S. India and Ceylon

For synthesis see C.I.58000

P & E, 23, 37, 52, 60

Mayer & Cook, 117

Watt, *Ann. de Chimie*, **4** (1790), 104

Kuhlmann, *Ann. Chim. Phys.* **24** (2) (1823), 225

Colin & Robiquet, *J. Pharm. Chim.* **12** (1826), 407; **13** (1827), 447

Robiquet, *Ann. Chim. Phys.* **63** (2) (1836), 297

Anderson, *Trans. Roy. Soc. Edin.* **16** (1849), 435

Kopp, *Bull. Soc. Chim.* **2** (2) (1864), 231

Schützenberger & Paraf, *Bull. Soc. Ind. Mulhouse*, **31** (1861), 505; *Jahresber.* (1862), 496

Schützenberger & Schiffert, *Bull. Soc. Ind. Mulhouse*, **34** (1864), 70

Stenhouse, *JCS*, **17** (1864), 333

Bolley, *J. pr. Ch.* **91** (1864), 229

Rochleder, *Ber.* **3** (1870), 292

Rosenstiehl, *Compt. rend.* **79** (1874), 680; **84** (1877), 559; *Ann.*

Chim. Phys. **4** (5) (1875), 311; **7** (5) (1876), 546; **13** (5) (1878),

248; **18** (5) (1879), 224

Liebermann, *Ann.* **183** (1876), 214

Plath, *Ber.* **9** (1876), 1204

Schunck & Roemer, *JCS*, **33** (1878), 422

Noah, *Ann.* **241** (1887), 266

Marchlewski, *JCS*, **63** (1893), 1137

Perkin & Hummel, *ibid.* 1157

Philips, *JACS*, **49** (1927), 473

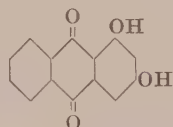
Mitter & Biswas, *J. Indian Chem. Soc.* **4** (1927), 535

Hill & Richter, *JCS*, (1936), 176; *Proc. Roy. Soc. B*, **121** (1937), 556

Richter, *JCS*, (1936), 1701

Zemplén & Bognár, *Ber.*, **72B** (1939), 913

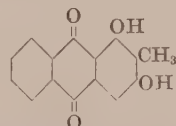
Schaeffer, *Ciba Rev.* **4** (1941), 1398

75340 C.I. Natural Red 8, 16Common name **Purpuroxanthin** or **Xanthopurpurin**

Occurs in madder and munjeet. Dyes yellow on alum mordant

P & E, 29, 42
Mayer & Cook, 120
Plath, Ber. 9 (1876), 1204
Noah, Ber. 19 (1886), 332
Perkin & Story, JCS (1929), 1399, 1415

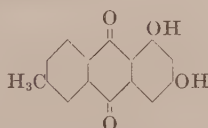
Aqueous alkaline solution — red

75350 C.I. Natural Red 8, 16Common name **Rubiadin**

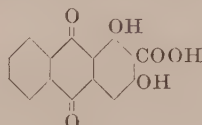
In madder, C.I. Natural Red 8, as 1,3-dihydroxy-2-methylantraquinone 3- β -glucoside, but probably present in an even more complex form in the plant. Also in many species of *Galium*, C.I. Natural Red 18, as the primeveroside

P & E, 31
Mayer & Cook, 121, 125
Stouder & Adams, JACS, 49 (1927), 2043
Mitter & Gupta, JSDC, 44 (1928), 31; *J. Indian Chem. Soc.* 5 (1928), 25
James & Robertson, JCS (1930), 1699; (1933), 1167

Aqueous alkaline solution — red

75360 C.I. Natural Red 19Common name **Morindanigrin**Occurs in Mang-kouda, the root bark of *Morinda umbellata* L.

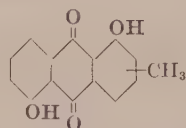
Mayer & Cook, 129
Perkin & Hummel, JCS, 65 (1894), 851

75370 C.I. Natural Red 16, 8Common name **Munjistin** or **Purpuroxanthincarboxylic acid**

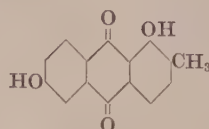
Occurs in madder, munjeet and together with an isomeride in **Manjistin**. Dyes orange red on alum mordant but is fast neither to light nor washing

P & E, 29, 32, 42
Mayer & Cook, 120
Schunck & Roemer, Ber. 10 (1877), 172, 790; *JCS*, 31 (1877), 666; 33 (1878), 422
Mitter & Sen, J. Indian Chem. Soc. 5 (1928), 631
Mitter & Brawas, Nature, 126 (1930), 761; 127 (1931), 166; *Ber.* 65B (1932), 622

Aqueous alkaline solution — red
 H₂SO₄ conc. — intense yellow

75380 C.I. Natural Red 18Common name **Morindadiol**

A yellow colouring matter present in Morinda Root

Mayer & Cook, 119, 129**75390 C.I. Natural Red 18**Common name **Soranjidiol**

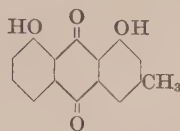
A dark reddish brown colouring matter present in Morinda Root

Mayer & Cook, 119, 129

75400 C.I. Natural Yellow 23

P & E, 53, 59, 71
Mayer & Cook, 122

Common name **Chrysophanic Acid**



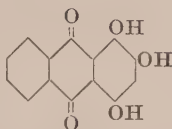
Occurs as a glucoside in the dried roots of Turkey Rhubarb, *Rheum palmatum* L. Dyes unmordanted wool yellow but chromed wool red

Slightly soluble in water to a pale yellow solution which turns red on adding alkali
 H_2SO_4 conc. — red

75410 C.I. Natural Red 16, 8

P & E, 24, 42
Mayer & Cook, 123

Common name **Purpurin**



Occurs as the principal colouring matter in Munjeet, C.I. Natural Red 16; also present as the glucoside in madder, C.I. Natural Red 8. Dyes bright scarlet on alum mordant

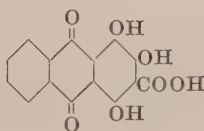
For synthesis see C.I.58205

Slightly soluble in boiling water
 H_2SO_4 conc. — red

75420 C.I. Natural Red 14, 9, 8

P & E, 27
Mayer & Cook, 124
Mitter & Beswas, *J. Indian Chem. Soc.* **4** (1927), 535
Hill & Richter, *JCS* (1936), 1716

Common name **Pseudopurpurin**



The main colouring matter in *Galium*, C.I. Natural Red 14; also present in Madder and Wild Madder, C.I. Natural Red 8. Its alum lake has unusual brilliance, the superiority of natural madder lakes over the synthetic product being probably due to its presence

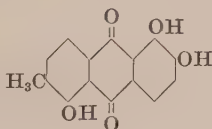
For synthesis see C.I.58220

Orange red solution in hot water

**75430 C.I. Natural Red 19
C.I. Natural Yellow 13**

P & E, 46
Mayer & Cook, 129
Perkin & Hummel, *JCS*, **65** (1894), 851

Common name **Morindon**

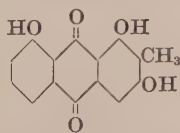


Is the main pigment in Oungkouda, C.I. Natural Red 19

**75440 C.I. Natural Green 2
C.I. Natural Yellow 14**

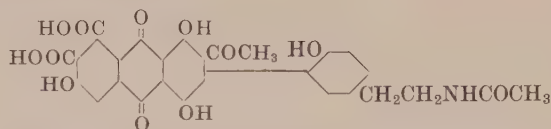
P & E, 55, 60, 62, 210
Mayer & Cook, 130
Cross, *Thorpe*, **X**, 516

Common name **Emodin** or **Frangula-emodin**



Present as the glucoside frangula in *Rhamnus frangula* or as frangulin, the rhamnoside of emodin, and as rhamnocathartin (contains emodin, rhamnose and a hexose as structural units) in the Purging Buckthorn, *R. cathartica*

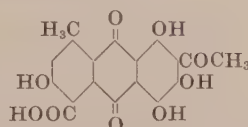
Aqueous alkaline solution — red

75450 C.I. Natural Red 25Common name **Laccaic Acid**

The solidified exudation of the insect *Coccus laccae*, growing on various trees in the E. Indies, Ceylon and the Moluccas, contains approximately 50% of laccaic acid which is extracted by dilute aqueous sodium carbonate. Dyes crimson on an alum mordant

Crookes, 354
P & E, 91
Mayer & Cook, 144
Thorpe, VII, 158

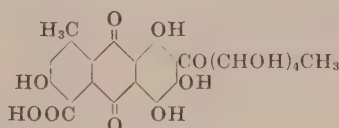
Aqueous solution — blood red

75460 C.I. Natural Red 3Common name **Kermesic Acid**

The females of the insect *Coccus ilici* which lives on the holm oak (*Ilex*) and the evergreen or algerian oak (*Quercus coccifera*) in Spain, Portugal and Morocco are killed by exposure to the steam from boiling vinegar, dried, the wax removed with a solvent, acidified and the dye extracted with a solvent. Dyes scarlet on alum mordant

Crookes, 353
P & E, 95
Mayer & Cook, 141
Thorpe, VII, 98
Dimroth & Kämmerer, *Ber.* **53B** (1920), 471
Born, *Ciba Rev.* **2** (1938), 206

Slightly soluble in cold and soluble in hot water to yellowish red solution
H₂SO₄ conc. — violet red, turning blue on addition of boric acid

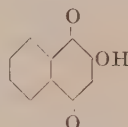
75470 C.I. Natural Red 4Common name **Carminic Acid**

Makes up approximately 10% of the dried bodies of the female of *Coccus cacti*, an insect which lives upon cacti of the Prickly Pear family, *Nopalea coccinellifera*, cultivated in nopales in Mexico, Central and S. America, the E. and W. Indies, Canary Islands, Palestine, Jordan, etc. It dyes scarlet on an alum mordant

Carmine is the aluminium-calcium lake of carminic acid; the aluminium and aluminium-tin lakes also find use as pigments

Soluble in hot water
NaOH 10% — crimson

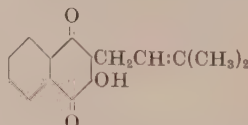
Discoverer — First isolated by Pelletier and Caverton, *Ann. Chim. Phys.* **8** (2) (1818), 250
Bersch, 354
P & E, 77, 627
Mayer & Cook, 137
Thorpe, III, 226
Schaller, *Bull. Soc. Chim.* **2** (2) (1864), 414; *Z. Chem.* (1865), 464
Vogel, *Ber.* **11** (1878), 1367
Bichoff, *Ber.* **23** (1890), 1905
Feitler, *Z. angew. Chem.* (1892), 136
von Miller, Rohde & Schunck, *Ber.* **26** (1893), 2660
Liebermann, *Ber.* **31** (1898), 2080
Landau, *Ber.* **33** (1900), 2442
Liebermann & Landau, *Ber.* **34** (1901), 2153
Liebermann & Lindenbaum, *Ber.* **35** (1902), 2910
Dimroth, *Ber.* **43** (1910), 1387
C. & H. Liebermann, *Ber.* **47** (1914), 1213
Dimroth & Kämmerer, *Ber.* **53B** (1920), 471
Miyagawa, *Mem. Coll. Eng. Kyushu Imp. Univ.* **4** (1926), 99
Meldrum & Alimchandani, *J. Indian Chem. Soc.* **6** (1929), 253
Born, *Ciba Rev.* **2** (1938), 214

75480 C.I. Natural Orange 6Common name **Lawson**

Present in the leaves of the Egyptian privet (known in India as Mehendi), *Lawsonia alba* Lam., also those of *L. spinosa* and *L. inermis* L., grown all over India

Coty S.A., BP 236557
I.G., BP 493855
Redgrave & Bari-Woolls, *Hair Dyes and Hair Dyeing*, London (1939)
Mayer & Cook, 105
Cox, *Chem. & Ind.* **55** (1936), 780; *Analyst*, **63** (1938), 397
Molho & Mentzer, *Experimentia*, **6** (1950), 11

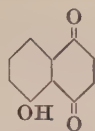
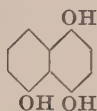
Soluble in water

75490 C.I. Natural Yellow 16Common name **Lapachol**

Present in Taigu or Lapachol wood obtained from several S. American species of *Bignoniaceae*, in the W. African Bethabara wood and in Surinam "greenheart" wood. Together with a yellow compound which is insoluble in aqueous sodium carbonate it forms **Tecomin**, the pigment derived from *Bignonia tocomia* (Ipé-tobacco wood) a Brazilian tree and several related species, e.g. *Tecoma ipé* and *T. ochrana*

P & E, 102
Mayer & Cook, 109, 253
Fieser, *JACS*, **49** (1927), 857

Slightly soluble in hot water
NaOH 10% — red

75500 C.I. Natural Brown 7Common name **Juglone, Nucin or Regianin** α -Juglone

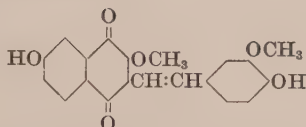
Occurs as the leuco compound; α -juglone, in walnut shells. The shells are ground, fermented for two days and then extracted with hot water

Encyclopedia Brit. **17** (1796), 621

Mayer & Cook, 105

Bernthsen & Semper, *Ber.* **20** (1887), 939Willstätter & Wheeler, *Ber.* **47** (1914), 2798

Juglone is insoluble in water, α -juglone is soluble in hot water
 H_2SO_4 conc. — blood red
 NaOH 10% — purple

75510 C.I. Natural Red 22, 23Common name **Deoxysantalol**

The main colouring matter in Sanderswood, C.I. Natural Red 22, also present in Barwood, C.I. Natural Red 22, and in False Red Sanderswood, C.I. Natural Red 23

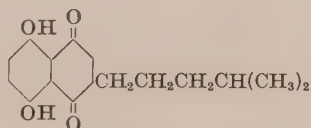
Discoverer — First isolated by Pelletier, *Ann. Chim. Phys.* **51** (2) (1832), 193

P & E, 584

Mayer & Cook, 147

Cross, *Thorpe*, **X**, 673Lal, *Proc. Nat. Acad. Sci. India*, **9** (1939), 83

NaOH 10% — scarlet

75520 C.I. Natural Red 20Common name **Alkannan**

A minor component of Alkanet, see Alkannin, C.I.75530

FIAT 101

Mayer & Cook, 111

Thorpe, **I**, 236, **VII**, 272**75530 C.I. Natural Red 20**Common name **Alkannin or Anchusin**

Alkannin has the same formula as Shikonin, C.I.75535, of which it is the optical antipode

Present in the root of *Anchusa tinctoria* Lam. found in Asia Minor, Greece, Hungary, etc.; also in Dyer's Buglos, False Alkannin, Ox-tongue Root and other plants. Used as a red dye for cosmetics and food; formerly used in dyeing and calico printing to yield deep violets on an alum mordant

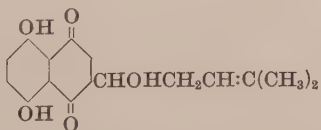
FIAT 101

P & E, 73

Mayer & Cook, 110

Raudnitz & Stein, *Ber.* **67B** (1934), 1955Underwood, Toribara & Neumann, *JACS*, **72** (1950), 5597

Slightly soluble in water; very soluble in organic solvents, hydrocarbons, etc. to a red solution
 NaOH 10% — deep blue

75535Common name **Shikonin or Tokyo Violet**

Shikonin has the same formula as Alkannin, C.I.75530, of which it is the optical antipode

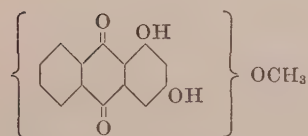
Present in the root of *Lithospermum erythrorhizon* known in N.E. Japan as *Shikone*

Mayer & Cook, 111

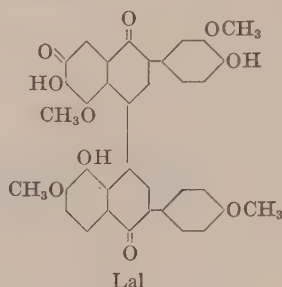
Cross, *Thorpe*, **VII**, 372; **X**, 728Koroda & Wada, *Chem. Z.* **1** (1937), 3156

75540 C.I. Natural Red 22

Common name **Santalin**, $C_{24}H_{22}O_8$, the structure of which has not yet been established but the following have been suggested



Dieterle and Stegemann



Lal

One of the components of Sanderswood, Barwood and Sandalwood

Discoverer — First isolated by Pelletier in 1832

Ann. Chem. Phys. **51** (2) (1832), 193

P & E, 581

Mayer & Cook, 147

Cross, *Thorpe*, **X**, 673

Dieterle & Stegemann, *Arch. Pharm.* **264** (1926), 1

Lal, *Proc. Nat. Acad. Sci. India*, **9** (1939), 83

Robertson & Whalley, *JCS* (1954), 2794

Insoluble in water

NaOH 10% — dull red

75550 C.I. Natural Red 22

Common name **Isosantal**

An isomeride of santalin and deoxyisosantal

The main colouring matter in Camwood

P & E, 591

Mayer & Cook, 150

Thorpe, **II**, 260

NaOH 10% — dull violet

75560 C.I. Natural Red 22

Common name **Deoxyisosantal**

An isomer of santalin and isosantal

A component of Camwood

P & E, 592

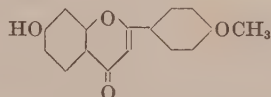
Mayer & Cook, 150

Thorpe, **II**, 260

NaOH 10% — dull scarlet

75570 C.I. Natural Yellow 10

Common name **Pratol**



Present in the blossoms of the red clovers *Trifolium pratense* and *T. incarnatum*

P & E, 203

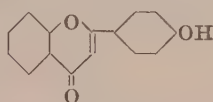
Mayer & Cook, 170

Paris, *Produits pharm.* **6** (1951), 543

Soluble in water

75580 C.I. Natural Yellow 1, 2

Common name **Apigenin**



Present both in the free state and as the glucoside apigenin in the dried flower heads of the Roman and Greek chamomiles, *Anthemis nobilis* L. and *Matricaria Chamomilla* L. Also present in Weld extract, C.I. Natural Yellow 2

FIAT 90

P & E, 154

Mayer & Cook, 172

Baker, *Thorpe*, **X**, 6

Power & Browning, *JCS*, **105** (1914), 1833

Paris, *Produits pharm.* **6** (1951), 543

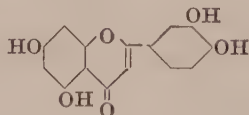
Insoluble in water

H_2SO_4 conc. — yellow with faint greenish fluorescence

NaOH 10% — yellow, purple brown on addition of $FeCl_3$

75590 C.I. Natural Yellow 2

Common name **Luteolin**



Present in the herbaceous plant Dyer's Rocket or Weed, *Reseda luteola*, found in many parts of Central Europe and formerly cultivated in England, France, Germany and Austria. The colouring matter is present in very small quantities throughout the plant, the leaves and seeds containing more than the stems. Also present in the Dyer's Broom or Greenwood, *Genista tinctoria* L. common in England and throughout S. Europe and Russia. Luteolin glucoside is present in the aqueous extract of the leaves of "Yama-Kariyasu", a graminea, which have long been used in Japan for dyeing yellows

P & E, 154, 159

Mayer & Cook, 179

Chevreur, *Ann.* **82** (1852), 53

Moldenhauer, *Ann.* **100** (1856), 180

Schützenberger & Paraf, *Compt. rend.* **52** (1861), 92

Rochleder, *Z. Chem.* (1886), 602

Perkin, *Proc. Chem. Soc.* **12** (1896), 105; *JSDC*, **12** (1896), 138;

JCS, **69** (1896), 206, 799

Herzig, *Monatsh.* **17** (1896), 421; *Ber.* **29** (1896), 1013; **30** (1897), 656

Perkin & Wilkinson, *JCS*, **81** (1902), 590

Perkin, *Proc. Chem. Soc.* **28** (1912), 328

Perkin & Watson, *JCS*, **107** (1915), 199

Baker & Robinson, *JCS*, **127** (1925), 1981; (1926), 2713; (1928), 3115

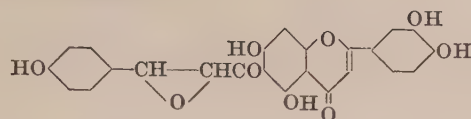
Paris, *Produits pharm.* **6** (1951), 543

Miyoshi, *J. Chem. Soc. Japan* (Pure Chem. Sectn.), **72** (1951), 705

Slightly soluble in hot water

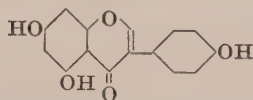
H_2SO_4 conc. — dark reddish yellow

NaOH 10% — deep yellow

75600Common name **Fukugetin**Present in the bark of *Garcinia spicata* and *Xanthocymus oralifolia*

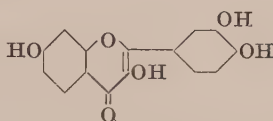
P & E, 160
Mayer & Cook, 203
 Paris, *Produits pharm.* **6** (1951), 543

H₂SO₄ conc. — yellow
 NaOH 10% — yellow

75610Common name **Genistein** or **Prunetol**

Present as the glucoside genistin in the Dyer's Broom or Greenwood, *Genista tinctoria* L. Dyes pale yellow on an alum or chrome and reddish brown on an iron mordant

P & E, 159
Mayer & Cook, 195
 Bielig, *FIAT Rev. German Chemistry 1939-46, Biochemistry Part I*, 87
 Perkin & Newbury, *JCS*, **75** (1899), 830
 Paris, *Produits pharm.* **6** (1951), 543

75620 C.I. Natural Brown 1Common name **Fisetin**

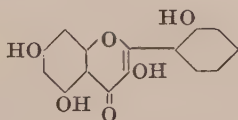
Present in the wood of the stem and lower branches of the Venetian Sumach, *Rhus cotinus*, a small tree found in E. and S. Europe, the Levant, Jamaica, etc., also in the wood of *Quebracho colorado*. Probably present as a tannic glucoside, fustin tannide, which readily hydrolyses to fisetin. Dyes brownish orange on alum, reddish brown on chrome, brown olive on iron and bright reddish orange on tin

Cotinin was the dried sodium carbonate extract of these woods

Discoverer — Chevreul 1839
P & E, 186, 461
Mayer & Cook, 184
Leçons de Chimie appliquée à la Teinture, Paris (1829), **II**, 150
 Nowack & Bend, *GP* 2552
 Preisser, *Ann.* **52** (1844), 385
 Bolley, *Schweiz. Polyt. Z.* **9** (1864), 22; *J. pr. Ch.* **91** (1864), 238
 Koch, *Ber.* **5** (1872), 285
 Schmid, *Ber.* **19** (1886), 1734
 Herzig, *Monatsh.* **12** (1891), 177; **15** (1894), 687; **17** (1896), 425; **20** (1894), 464
 Herzig & Smoluchowski, *ibid.* **14** (1893), 39
 Perkin & Pate, *JCS*, **67** (1895), 648
 von Kostanecki & Tambor, *Ber.* **28** (1895), 2302
 Perkin & Hummel, *JCS*, **69** (1896), 1290
 Perkin & Gunnel, *ibid.* 1303
 Perkin, *JCS*, **75** (1899), 441
 Perkin & Wilkinson, *JCS*, **81** (1902), 590
 von Kostanecki, Lampe & Tambor, *Ber.* **37** (1904), 784
 von Kostanecki & Nitkowski, *Ber.* **38** (1905), 3587
 Meunier & Bonnet, *Rev. gén. Mat. col.* **29** (1925), 365
 Allan & Robinson, *JCS* (1926), 2334
 Oymada, *J. Chem. Soc. Japan*, **55** (1934), 755; **56** (1935), 980
 Paris, *Produits pharm.* **6** (1951), 543

Slightly soluble in hot water

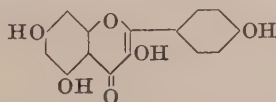
NaOH 10% — yellow, becoming brown on exposure to air

75630 C.I. Natural Yellow 12Common name **Datiscetin**

Present in the root, leaves and branches of the Bastard Hemp, *Datisca cannabifolia* L., as the glucoside, datiscin, C₂₇H₃₀O₁₅, which hydrolyses to datiscetin and rutinose. The root is used commercially in N. India as Akalbair

P & E, 620
Mayer & Cook, 182
 Paris, *Produits pharm.* **6** (1951), 543

H₂SO₄ conc. — yellow with green fluorescence
 NaOH 10% — yellow

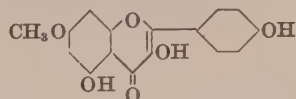
75640 C.I. Natural Yellow 13, 10Common names **Kaempferol**, **Kampherol**, **Trifolitin**, **Indigo Yellow**, **Robigenin** or **Rhamnolutin**

Present as kaempferitin, a 3-rhamnoside, in Natal Indigo, *Indigofera arrecta*, C.I. Natural Blue 1, as trifolin in the red clover, *Trifolium pratense* L.; in Dyer's Knotgrass and as the main colouring matter in Hungarian Berries, C.I. Natural Yellow 13

P & E, 21, 60, 179, 212, 501
Mayer & Cook, 182
 Nakaoki, *J. Pharm. Soc. Japan*, **63** (1943), 444
 Paris, *Produits pharm.* **6** (1951), 606

Slightly soluble in water
 H₂SO₄ conc. — blue fluorescence
 NaOH 10% — yellow

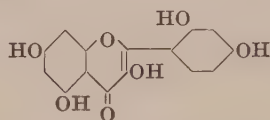
75650 C.I. Natural Green 2
C.I. Natural Yellow 13
 Common name **Kaempferol 7-methyl ether**



Present in Sap Green and Hungarian Berries

75660 C.I. Natural Yellow 8, 11

Common name **Morin**



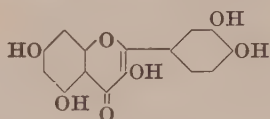
Present together with maclurin in the wood of the Dyer's Mulberry, *Chlorophora tinctoria* Gard., found throughout the Americas and the W. Indies, also in the wood of the Osage Orange tree, *Maclura pomifera* Reif (or *Toxylon pomiferum*), an oak growing in Texas, Oklahoma and Pennsylvania. It is the sole colouring matter in the Jack or Jackwood, *Artocarpus integrifolia* L. cultivated in India, Burma and Ceylon. Dyes yellow on alum, olive yellow on chrome, lemon yellow on tin and deep olive brown on iron

Calico Yellow (Gy) was the bisulfite compound of morin, $C_{15}H_{10}O_7$, $NaHSO_3$, used in calico printing — Lepetit, Dollfuss and Gannser, GP 91603

Slightly soluble in water
 H_2SO_4 conc. — yellow with bright greenish fluorescence
 NaOH 10% — yellow going brown in air

75670 C.I. Natural Yellow 10, 13
C.I. Natural Red 1

Common names **Quercetin, Quercitin, Meletin or Sophoretin**

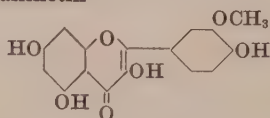


The chief product obtained by rapidly extracting powdered Quercitron Bark, C.I. Natural Yellow 10, with dilute ammonia and boiling the extract with sulfuric acid. It is also a minor component of Persian Berries extract, etc., C.I. Natural Yellow 13, and is found as a glucoside in Gunar, the flowers of *Cedrela Toona*, the Toon or Indian mahogany tree, C.I. Natural Red 1, and in the flowers of many species of clover. Also present in the inner bark of an oak *Quercus discolor* Ait., found in Pennsylvania, Georgia and Carolina. Widely distributed in many plants, e.g. horse chestnuts, onion skins, tea, sumach, etc. Dyes brownish orange on alum, reddish brown on chrome, olive black on iron, and bright orange on tin.

Slightly soluble in hot water
 H_2SO_4 conc. — yellow, faint green fluorescence
 NaOH 10% — golden yellow, browning in air

75680 C.I. Natural Yellow 10

Common name **Isorhamnetin**



Present in the common red clover, *Trifolium pratense*, together with pratol and many other phenolic compounds allied to the flavones; also in Asbarg, the dried fruits and flowering stems of *Delphinium zaili* found in great quantities in Afghanistan. Dyes a less reddish yellow than Quercitron Bark

Cross, *Thorpe*, **X**, 516
 Paris, *Produits pharm.* **6** (1951), 543

Discoverer — Chevreur 1839

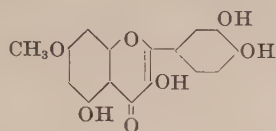
Bersch, 351
P & E, 174, 213, 219
Mayer & Cook, 187
Thorpe, **IX**, 81, 138
Leçons de Chimie appliquée à la Teinture, Paris (1839), **II**, 150
Preisser, *Ann.* **52** (1844), 381
Wagner, *J. pr. Ch.* **51** (1850), 82; **52** (1851), 449; *Jahresber.* (1850), 529
Benedikt & Hazura, *Ber.* **8** (1875), 605; *Monatsh.* **5** (1884), 63, 165
König & von Kostanecki, *Ber.* **27** (1894), 1994
Ciamician & Silber, *Ber.* **27** (1894), 1627; **28** (1895), 1393
Bablich & Perkin, *Proc. Chem. Soc.* **12** (1896), 106
Herzig, *Monatsh.* **17** (1896), 427; **30** (1909), 527
Perkin & Wood, *Proc. Chem. Soc.* **14** (1898), 56
Perkin, *JCS*, **73** (1898), 670; **87** (1905), 715
von Kostanecki & Tambor, *Ber.* **37** (1904), 794
Perkin & Robinson, *Proc. Chem. Soc.* **22** (1906), 305
von Kostanecki, *Lampe & Tambor*, *Ber.* **39** (1906), 4014, 4022
Hoesch & von Zarzecki, *Ber.* **50** (1917), 462, 660
Barker & Hurst, *JSDC*, **43** (1927), 254
Desmurs, *J. Inter. Soc. Leather Tr. Chem.* **12** (1928), 424
Robinson & Venkataraman, *JCS* (1929), 61
Grinbaum & Marchlewski, *Biochem. Z.* **290** (1937), 261; *Bull. Acad. Polonaise*, **A** (1937), 60
 Paris, *Produits pharm.* **6** (1951), 543, 606

Discoverer — Bancroft 1775

P & E, 125, 175, 187, 201, 212, 216
Mayer & Cook, 188
Barker, *Thorpe*, **X**, 8
 Cross, *ibid.* 343
Bolley, *Ann.* **37** (1841), 101; **115** (1860), 57
Preisser, *Ann.* **52** (1844), 377
Rigaud, *Ann.* **90** (1854), 283
Leeshing, *Dingl.* **139**, 131
Schützenberger & Paraf, *Bull. Soc. Ind. Mulhouse*, **31** (1881), 507
Hlasiwetz & Pfandler, *J. pr. Ch.* **94** (1) (1865), 97
Liebermann & Hamburger, *Ber.* **12** (1879), 1178
Liebermann, *Ber.* **17** (1884), 1680
Herzig, *Monatsh.* **5** (1884), 72; **6** (1885), 863; **9** (1888), 537; **12** (1891), 172, 187; **15** (1894), 683
Tesmer, *Ber.* **18** (1885), 2609
Herzig & Smoluchowski, *Monatsh.* **14** (1893), 53
Perkin & Pate, *JCS*, **67** (1895), 646
von Kostanecki, *Ber.* **28** (1895), 2302
Dunstan & Henry, *JCS*, **73** (1898), 219
Perkin, *JCS*, **75** (1899), 438, 449
Perkin & Allinson, *JCS*, **81** (1902), 471
Moore, *Proc. Chem. Soc.* **26** (1910), 182
Nierenstein & Wheldale, *Ber.* **44** (1911), 3487
Herzig, *Schönbusch & Böttcher*, *Monatsh.* **33** (1912), 673, 683
Asahina et al, *J. pr. Ch.* **106** (1923)
Malkin & Nierenstein, *JACS*, **52** (1930), 2864
 Paris, *Produits pharm.* **6** (1951), 543, 606
Geissman & Lischner, *JACS*, **74** (1952), 3001
Hörhammer & Hänsel, *Arch. Pharm.* **285** (1952), 438

FIAT 91

P & E, 61, 203, 212
Mayer & Cook, 189
Perkin & Hummel, *JCS*, **69** (1896), 1566
Perkin & Pilgrim, *JCS*, **73** (1898), 268
Power & Salway, *JCS*, **97** (1910), 245
Heap & Robinson, *JCS* (1926), 2336
Fukurada, *Chem. Z.* **1** (1928), 2100
 Paris, *Produits pharm.* **6** (1951), 543

75690 C.I. Natural Yellow 13Common name **Rhamnetin** or **β -Rhamnocitrin**

Xanthorhamnin, the 3-rhamnoside of rhamnetin, C.I.75695, is the chief pigment in the dried, immature berries of various shrubs of the Buckthorn family, e.g. *Rhamnus amygdalinus*, *R. oleoides* and *R. saxatilis* exported from Smyrna and Aleppo, the French *R. alaternus* and *R. infectorius*, etc

Slightly soluble in water

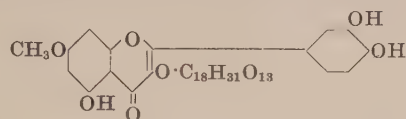
 H_2SO_4 conc. — yellow with greenish blue fluorescence

NaOH 10% — yellow, becoming brown with orange red ppt. in air

FIAT Rev. 91

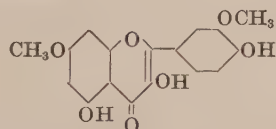
P & E, 207, 211

Mayer & Cook, 189

Fleury, *J. pr. Ch.* **26** (1842), 226Kane, *Phil. Mag.* **23** (3) (1843), 3Preisser, *Ann.* **52** (1844), 384Gellatly, *Edin. New Phil. J.* **7** (2) (1858), 252Ortlieb, *Bull. Soc. Ind. Mulhouse*, **30** (1860), 16Schützenberger & Bertèche, *ibid.* **35** (1865), 455Lefort, *Compt. rend.* **63** (1866), 840, 1081Schützenberger, *Ann. Chem. Phys.* **15** (4) (1868), 1118; *Bull. Soc. chim.* **10** (1868), 179Stein, *J. pr. Ch.* **105** (1) (1868), 97; *Jahresber.* (1868), 777Liebermann & Hörmann, *Ber.* **11** (1878), 952; *Ann.* **196** (1879), 299Smorawski, *Ber.* **12** (1879), 1595Fischer, *Ber.* **28** (1895), 1162Perkin & Martin, *JCS*, **71** (1897), 818Perkin, *JCS*, **75** (1899), 438C. & G. Tanret, *Compt. rend.* **129** (1899), 725; *Bull. Soc. Chim.* **21** (3) (1899), 1073Attree & Perkin, *JCS* (1927), 234Robinson & Robinson, *Biochem J.* **27** (1933), 206Paris, *Produits pharm.* **6** (1951), 543**75695 C.I. Natural Green 2
C.I. Natural Yellow 13**Common name **Xanthorhamnin** or **Rhamnetin 3-rhamnoside**

Present in Sap Green and Hungarian Berries, cf. C.I.75690

Mayer & Cook, 189

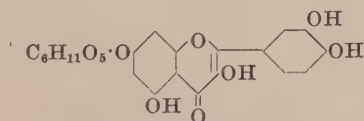
Cross, *Thorpe*, **X**, 516Paris, *Produits pharm.* **6** (1951), 543**75700 C.I. Natural Yellow 13**Common name **Rhamnazin**

Present as a minor component in Persian Berries extract and in the Dyer's Buckthorn, *Rhamnus tinctoria* Waldst. and Kit

FIAT Rev. 91

P & E, 207

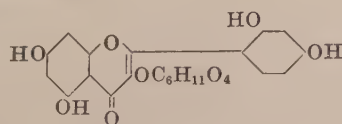
Mayer & Cook, 190

Paris, *Produits pharm.* **6** (1951), 543**75710 C.I. Natural Yellow 10**Common name **Quercimeritrin**

Present together with gossypetin, C.I.75750, in the flowers of the Indian cotton plant *Gossypium herbaceum*

P & E, 227

Mayer & Cook, 186

Perkin, *JCS*, **75** (1899), 862; **95** (1909), 2181; **103** (1913), 650Attree & Perkin, *JCS* (1927), 234Baker, Nodzu & Robinson, *JCS* (1929), 74Paris, *Produits pharm.* **6** (1951), 543**75720 C.I. Natural Yellow 10**Common name **Quercitrin**

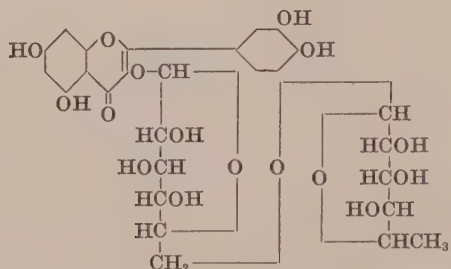
The 3-rhamnoside of quercetin. It is the chief constituent of the product obtained by extracting Quercitron Bark with high pressure steam. Also obtained from the skins of arachis nuts. Dyes golden yellow on alum, brownish yellow on chrome and deep olive on iron

Administrator of the U.S. Federal Security Agency, *USP* 2557164

P & E, 193, 200

Mayer & Cook, 188

Paris, *Produits pharm.* **6** (1951), 543

75730 C.I. Natural Yellow 10Common name **Rutin**

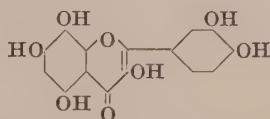
Present in the buds of *Sophora japonica*, Chinese or Avignon (Yellow) berries and many other plants. Rutin does not hydrolyse on dyeing and yields brownish yellow oranges on alum-mordanted wool

U.S. Secy. of Agriculture, *USP* 2520127*FIAT* 94*P & E*, 197, 200

Mayer & Cook, 188

Cross, *Thorpe*, **X**, 345Shimizu & Ohta, *J. Pharm. Soc. Japan*, **71** (1951), 885Paris, *Produits pharm.* **6** (1951), 543Hörhammer & Hänsel, *Arch. Pharm.* **285** (1952), 438

Slightly soluble in cold water, soluble in boiling water

**75750 C.I. Natural Brown 5
C.I. Natural Yellow 10**Common name **Gossypetin**

Present together with quercetin, C.I.75670, in the flowers of the Indian cotton plant *Gossypium herbaceum* L., during dyeing it readily oxidises to gossypetone, $C_{15}H_8O_8$ which has strong affinity for mordanted wool. Dyes orange brown on alum, dull brown on chrome, dull olive on iron and orange red on tin mordants

P & E, 224

Mayer & Cook, 192

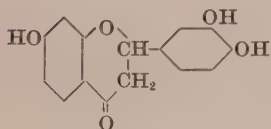
Perkin, *JCS*, **75** (1899), 826; **95** (1909), 181; **103** (1913), 650Attree & Perkin, *JCS* (1927), 234Baker, Nodzu & Robinson, *JCS* (1929), 74Paris, *Produits pharm.* **6** (1951), 543

Slightly soluble in water

Gossypetin: NaOH conc. — orange red; on dilution green, then blue and finally dull brown

Gossypetone: H_2SO_4 conc. — dull brown

NaOH 10% — pale blue

75760 C.I. Natural Yellow 28**Butin****Butein**

During dyeing butin is converted into butein

Present as butyrin, $C_{27}H_{32}O_{15}$, and isobutyricin, the mono- and diglucosides respectively of butein, in the dried flowers of *Butea frondosa*, the Dhak or Palas tree common in India and Burma. The flowers are boiled with dilute acid to hydrolyse the glucoside and the extract neutralised and evaporated to yield the dye which consists of a mixture of butein and butin. Dyes yellows to brownish blacks depending on the mordant used

FIAT 93*P & E*, 169

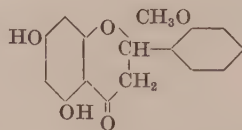
Mayer & Cook, 177

Paris, *Produits pharm.* **6** (1951), 543Puri & Seshadri, *J. Sci. Ind. Research* (India), **12B** (1953), 462

Butin and butein are both slightly soluble in hot water

Butin: NaOH 10% — pale orange red

Butein: NaOH 10% — deep orange red

75770Common name **Citronetin**

Mayer & Cook, 175

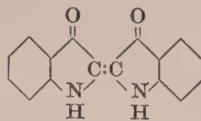
Phadke, 130

Shinoda & Sato, *Chem. Z.* **II** (1931), 2326Paris, *Produits pharm.* **6** (1951), 543

Present as the glucoside citronin in the acid fruit of *Citrus bergamia* Risso, cultivated in India where it is used in silk dyeing

75780 C.I. Natural Blue 1

Common name **Indigotin**



Present as the glucoside indican together with indirubin, C.I.75790, in natural indigo obtained from various species of *Indigofera* cultivated in India, Java, China, Japan, Philippine Islands, Central America and W. Indies, Brazil, Madagascar, Central and S. Africa. Also present in Woad, *Isatis tinctoria*, in the Wild Indigo root, *Baptista tinctoria*, and in Gara, the young leaves of *Lonchocarpus cyanescens* Benth. cultivated in W. Africa and the W. Sudan

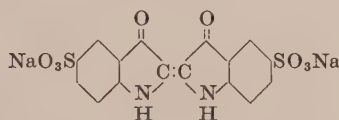
For synthesis see C.I.73000

Robertson, *JCS* (1927), 1937
Le Ferre & Pearson, *JCS* (1932), 2807
JSDC, 53 (1937), 248
Vetterli, *Ciba Rev.* 8 (1951), 3066
Haller, *ibid.* 3072

H₂SO₄ conc. — yellowish green; on dilution — blue ppt.
HNO₃ conc. — yellow

Capron de Dole & Dussaunce, *Blues & Carmines of Indigo*, Philadelphia (1863)
P & E, 475, 515
Harris, *A Primitive Dyestuff*, Cambridge (1927)
Mayer & Cook, 316
Thorpe, **VI**, 432
Bolley & Crinsoz, *Schweiz. Polyt. Z.* **11** (1866), 121
Rawson, *JSDC*, 4 (1888), 66; *Rep. Cult. & Man. Indigo in Bengal* (1899); *Rep. Cult. & Man. Indigo*, Mozzufferpore, 1904, 2nd Ed. (1907)
Fasal, *Mitt. Gew. Mus.* **11** (1895), 307
Coventry, *Indigo Improvements Synd. Rep.* 1901
Matthews, *JSCI*, **21** (1902), 222
Bloxam, Leake & Finlow, *Rep. Dalsingh Serai Res. Stat.* 1903-4
Perkin, *Proc. Chem. Soc.* **20** (1904), 172; **22** (1906), 198; *JCS*, **95** (1909), 847; *JSCI*, **28** (1909), 353
Bergtheil, *Rep. Indigo Res. Stat. Sirsiah*, 1906-7; 1908-11
Leake, *Rep. Dalsingh Serai Res. Stat.* 1905
Orchardson, Wood & Bloxam, *JSCI*, **26** (1907), 4
Perkin & Bloxam, *JCS*, **97** (1910), 1461
A. & G. L. Howard, *Agri. Res. Inst., Pusa, Bull. No. 51*, 54 (1915) & 67 (1916)
Reid, *Agri. J. India*, **12** (1917), 1
Watson, *JSCI*, **37** (1918), 81
Davis, *Agri. J. India*, **14** (1919), 21; *Agri. Res. Inst., Pusa, Indigo Pub. No. 7 & 8*; *Chem. & Ind.* (1924), 206, 303
Amin, *Agri. Res. Inst., Pusa, Indigo Pub. No. 5 Bull. Imp. Inst.* **17** (1919), 31
Macbeth & Pryde, *JCS*, **121** (1922), 1650
Fierz-David, *Kunst. Org. Farbst.* (1926), 432

75781 C.I. Natural Blue 2



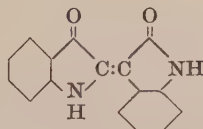
The principal component of the product obtained by sulfonating natural Indigo, C.I. Natural Blue 1.
For the synthetic product see C.I.73015

Discoverer — Barth 1740

Capron de Dole & Dussaunce, *Blues & Carmines of Indigo* Philadelphia (1863)
Dumas, *Ann.* **22** (1837), 72

75790 C.I. Natural Blue 1

Common name **Indirubin**

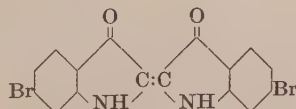


Present as an impurity from 2-4% in Bengal to 15% in Java indigo. Also present together with 6,6'-dibromoindigotin, C.I.75800, in the "double dyed" Tyrian Purple

P & E, 496
Mayer & Cook, 316
Schaeffer, *Chem. Z.* **65** (1941), 273

75800 Natural (Vat) Dye

Common name **Tyrian Purple**



Present in the juices of *Murex brandaris*, a sea snail found throughout the whole of the Mediterranean and in the juices of similar species found on the coasts of Mexico, Brittany, Wales and Norway. Used in ancient times for vat dyeing — **Tyrian Purple**, **Byzantium Purple**, **Purple of the Ancients** — and as an artists' pigment

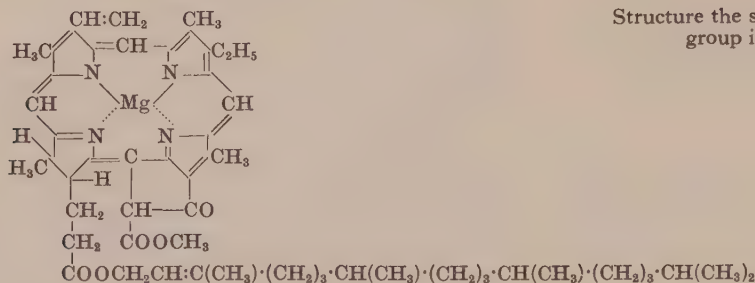
For the synthetic product see C.I.73060

M. trunculus also found throughout the Mediterranean yields two indigoid pigments, a blue and a bluish red, which are not 6,6'-dibromoindigo — Bouchilloux & Roch, *Compt. rend. sci. biol.* **148** (1954), 1583

FIAT 105
P & E, 528
Mayer & Cook, 317
Cole, *Phil. Trans.* (1685), 1278
Réaumur, *Mem. Acad. Roy. Sci.* (1711)
Duhamel, *ibid.* (1736)
Bancroft, *Philosophy of Permanent Colours* (1813), **1**, 120
Bizis, *J. Chim. méd.* **10** (1835), 99
A. & G. de Negri, *Gazz.* (1875), 437
Schunck, *JCS*, **35** (1879), 591; **37** (1880), 613
Friedländer, *Chem. Z.* **35** (1911), 640
Jackson, *Mem. Manchester Phil. Soc.* **60**, Part II (1915-16)
Formanek, *Z. angew. Chem.* **41** (1928), 1133
Springer, *Text. Col.* **52** (1930), 610
Majima & Kotake, *Ber.* **63** (1930), 2237
Rottig, *J. pr. Chem.* **142** (2) (1935), 35
Born, *Ciba Rev.* **1** (1937), 106
Schaeffer, *Chem. Z.* **65** (1941), 273
Driessen, *Melliand Textilber.* **25** (1944), 66

75810 C.I. Natural Green 3

Chlorophyll-a



In some commercial products the Mg is replaced by Cu or Fe. Present in the green leaves of plants (commercially produced from nettles) there being three parts of chlorophyll-a to one of chlorophyll-b together with an approximately constant proportion of carotenes and xanthophylls. The raw material is extracted with ethyl alcohol in copper vessels, usually in presence of concentrated aqueous copper sulfate. The alcohol is distilled off and the residue extracted with 90s benzol (coal tar hydrocarbons 90% of which distill at 100°C). The residue after distillation forms the basis of the various commercial preparations. Blue shaded products are coppered but the yellow are not coppered; in some cases iron replaces the magnesium or copper. Oil-soluble products are formed by mixing with natural or mineral oils or greases. Water-soluble products are obtained by saponifying with aqueous caustic soda.

Chlorophyll-b

Structure the same as that of chlorophyll-a, except that the methyl group in the upper right ring is replaced by formyl

Mayer & Cook, 295

Thorpe, II, 80

Schunck, *Chem. News*, **31** (1880), 32; **49** (1884), 2; *Proc. Roy. Soc.* **38** (1885), 336; **42** (1887), 184; **63** (1898), 389; **65** (1899), 177; **68** (1901), 474

Schunck & Marchlewski, *Ann.* **278** (1894), 329; **288** (1895), 209; **290** (1896), 306; *Ber.* **29** (1896), 1347

Nencki, *Ber.* **29** (1896) 2877

Marchlewski, *JCS*, **77** (1900), 1080

Stoll & Wiedermann, *Fortschritte der Chemie der organischen Naturstoffe*, Berlin (1938), I, 159; *Helv. chim. Acta*, **16** (1933), 739; *Atti del X Congresso internaz. de Chim.* **5** (1939), 206; *Schweiz. med. Wochenschr.* **77** (1947), 664; *Fortschr. Chem. Forsch.* **2** (1952), 538 (435 references)

Stoll, *Ein Gang durch biochemische Forschungsarbeiten*, Berlin (1933); *Experientia*, **4** (1948), 6

Fischer & Strell, *FIAT* 141

T. Vrbaški, *Arhiv Kem.* **22** (1950), 101; **23** (1951), 6

Judah, Burdick & Carroll, *Ind. Eng. Chem.* **46** (1954), 2262

Encycl. Chem. Tech. **3**, 873

Marks, *Heme and Chlorophyll* (London 1969)

75815 C.I. Natural Green 5

The water-soluble dicarboxylic acid obtained by alkaline hydrolysis of C.I. 75810

NOTES

OXIDATION BASES

During his experiments on the oxidation of aniline in 1834 Runge obtained a black precipitate and so produced in substance the first oxidation colour.

In 1856 Perkin, reacting aniline sulfate and potassium dichromate in the manufacture of Mauveine, obtained as a by-product large quantities of a black precipitate which was, in fact, Aniline Black. A few years later this substance had become valuable as a pigment in calico printing but its constitution and mode of formation were not determined until some fifty years later.

As the final products vary according to conditions of oxidation and the presence or absence of metals the Oxidation Bases have been listed according to starting materials.

Literature

Fierz-David, *Künstliche Organische Farbstoffe* (1926), Chapter X (pp. 337-349)

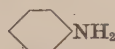
Forster and Soyka, *Fur Dyes: Oxidation and Identification*, JSDC, **47** (1931), 99 (Identification and bibliography of patent references)

I.G. *Manual for the Fur Trade* 1937

Diserens, *Die neuesten Fortschritte in der Anwendung der Farbstoffe*, Vol. 2 (1949), Chapter VIII and translation by Wengraf and Baumann, Vol. 2 (1951), Chapter VIII

76000 C.I. Oxidation Base 1

Aniline



76001 C.I. Oxidation Base 1

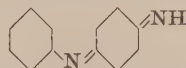
Hydrochloride of C.I.76000

The early stages of the production of Aniline Black from aniline consist of alternate oxidation and quinonoid addition to form Caro's Yellow Imine and then Willstätter's Blue and Red Imines until Leucoemeraldine with its eight nuclear benzene rings is formed when addition ceases

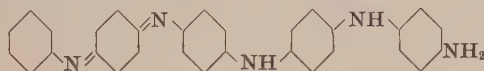
Increasing degrees of oxidation produce mono-, di-, tri- and tetra-quinonoid compounds and, if no free arylamine is present, these compounds are interchangeable according to the degree of oxidation or reduction to which they are subjected. All these compounds may be present in "greenable" blacks, i.e. blacks which turn green when exposed to sulfurous acid and other atmospheric reducing agents

If, however, free arylamine is present under mild oxidising conditions further addition takes place and three arylamine molecules are incorporated into the dye molecule to form the ungreenable azine Aniline Black. These various stages are set out below

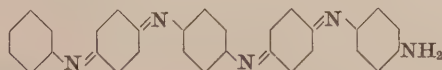
"Caro's Yellow Imine" (N-Phenyl-*p*-quinone diimine)
formed by oxidation and quinonoid addition



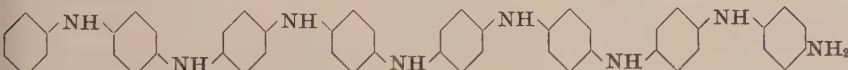
"Willstätter's Blue Imine" a monoquinonoid



"Willstätter's Red Imine"

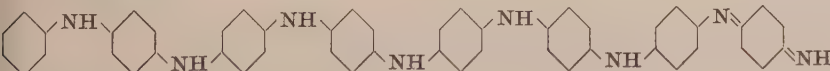


Leucoemeraldine



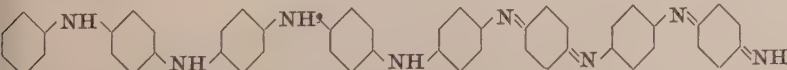
colourless, insoluble in solvents, slowly oxidising in air to

Protoemeraldine



a violet monoquinonoid compound giving yellowish green salts. Soluble in acetic acid (80%) (yellowish green)

Emeraldine



a blue diquinonoid compound giving green salts. Soluble in acetic acid (80%) (green)

Discoverer (Aniline Black) — J. Lightfoot 1863

References

Willstätter, *Chem. Ztg.* **30** (1906), 955

Willstätter & Moore, *Ber.* **40** (1907), 2665

Green, *JSDC*, **25** (1909), 188

Willstätter & Dorogi, *Ber.* **42** (1909), 2147, 4118

Willstätter & Crämer, *Ber.* **43** (1910), 2588, 2976

Green & Woodhead, *JCS*, **97** (1910), 2388; *Ber.* **45** (1912), 1117

Green & Wolff, *Ber.* **44** (1911), 2570; *JSDC*, **27** (1911), 301;

Ber. **46** (1913), 33; *JSDC*, **29** (1913), 105

Green & Johnson, *JSDC*, **29** (1913), 105

Erban, *Chem. Ztg.* **37** (1913), 1161

Literature

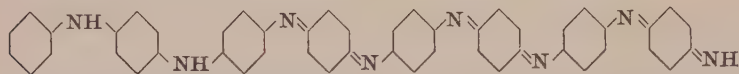
Saunders, *Scientific and Technical Work of A. G. Green*, JSDC, **60** (1944), 85

Diserens, *Chemical Technology of Dyeing and Printing*, **2**, 112

Venkataraman, 778

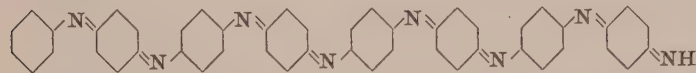
[continued over

Nigraniline



a dark blue triquinonoid compound giving unstable blue salts. Soluble in acetic acid (80%) or pyridine (blue soln.)

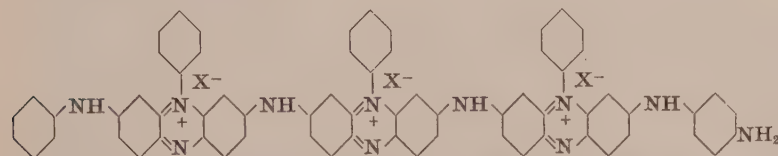
Pernigraniline



a black tetraquinonoid compound with black salts, both being very unstable

Emeraldine and nigraniline, when oxidised in presence of aniline give Aniline Black (C.I.50440) which is ungreenable while the intermediate compounds turn green on treatment with reducing agents

Aniline Black (ungreenable)



X = Acid radical, probably chromate in "aged" or "chromed" blacks

76005 Oxidation Base 19

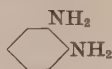


p-Aminoacetanilide

Beilstein, 13, 94

Soluble in alcohol, ether, water
H₂SO₄ conc. — colourless; on dilution — yellow
NaOH conc — colourless; on dilution — colourless
Ferric chloride added to aqueous soln. — colourless → reddish brown

76010 C.I. Oxidation Base 16



o-Phenylenediamine

Discoverer — M.L.B. 1907

M.L.B., GP 213581 (Fr. 9, 855)

FIAT 1313, 1, 412

FDX 885 (PB 74763) — Ursololiv GM

Beilstein, 13, 6

Soluble in chloroform, ethanol, ethyl ether, water (hot)

76011

Salt of C.I.76010

76015 Oxidation Base



4-Chloro-*o*-phenylenediamine

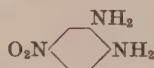
Ursol Olive 6G (IG)

Onnertz, USP 1536725

FDX 885 (PB 74763) — Ursololiv 6G

Beilstein, 13, 25

76020 Oxidation Base



4-Nitro-*o*-phenylenediamine

Discoverer — Agfa 1906

Agfa, GP 190622 (Fr. 9, 853)

Beilstein, 13, 29

76021 C.I. Oxidation Base 9A

Dihydrochloride of C.I.76020

FDX 885 (PB 74763) — Ursol 4G

Soluble in alcohol, water
Slightly soluble in caustic soda soln.
H₂SO₄ conc. — clear maroon; on dilution — yellow
NaOH conc. — reddish brown; on dilution — golden yellow ppt.
Ferric chloride added to aqueous soln. — yellow → orange
→ orange ppt.

76025 Oxidation Base
C.I. Developer 11



m-Phenylenediamine

Beilstein, **13**, 33

Soluble in ethanol, water
Slightly soluble in ethyl ether

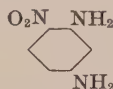
76027 Oxidation Base



4-Chloro-*m*-phenylenediamine

Beilstein, **13**, 53

76030 Oxidation Base

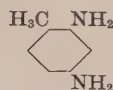


4-Nitro-*m*-phenylenediamine

Used as a component of mixtures — *see* Vol. 3, pp. 3265, 3266

Beilstein, **13**, 57

76035 C.I. Oxidation Base 20
C.I. Developer 14



Toluene-2,4-diamine

FIAT 1313, **1**, 411

FDX 885 (*PB* 74763) — Ursol G, Ursolbraun GGA

Beilstein, **13**, 124

Soluble in alcohol, water

Insoluble in caustic soda soln.

H₂SO₄ conc. — greenish brown; on dilution — yellowish brown

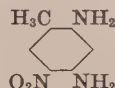
Ferric chloride added to aqueous soln. — almost colourless
→ dark brown

76036 Oxidation Base

Salt of C.I.76035

Used as a component of mixtures — *see* Vol. 3, pp. 3265, 3266

76040 Oxidation Base



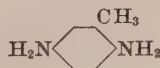
5-Nitrotoluene-2,4-diamine

Ursol 6G (IG)

FDX 885 (*PB* 74763) — Ursol 6G

Beilstein, **13**, 141

76042 Oxidation Base



Toluene-2,5-diamine

Beilstein, **13**, 144

76043 C.I. Oxidation Base 4

Sulfate of C.I.76042

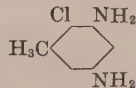
Soluble in alcohol, water

Slightly soluble in caustic soda

H₂SO₄ conc. — grey; on dilution — light brown

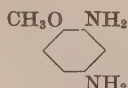
Ferric chloride added to aqueous soln. — green

76045 Oxidation Base



2-Chlorotoluene-3,5-diamine

Beilstein, **13**, 164

76050 C.I. Oxidation Base 124-Methoxy-*m*-phenylenediamine*Discoverers* — Erlenbach (Agfa) 1909; M.L.B. 1910Agfa, *GP* 226790 (*Fr.* 10, 950)M.L.B., *GP* 228245 (*Fr.* 10, 953)*BIOS* Survey 27, 39*FIAT* 764, *FDX* 885 (*PB* 74763) — Ursol L*Beilstein*, 13-I 204 14

Soluble in alcohol, water

Insoluble in caustic soda

 H_2SO_4 conc. — violet; on dilution — reddish brown

Ferric chloride added to aqueous soln. — light brown → dark brown

76051 C.I. Oxidation Base 12A

Sulfate of C.I.76050

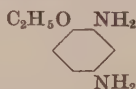
FIAT 1313, 1, 413*FDX* 885 (*PB* 74763) — Ursol SL, SLA

Soluble in alcohol, water

Insoluble in caustic soda soln.

 H_2SO_4 conc. — reddish brown; on dilution — brown

Ferric chloride added to aqueous soln. — brown → dark brown

76055 C.I. Oxidation Base 144-Ethoxy-*m*-phenylenediamine*Discoverers* — Erlenbach (Agfa) 1909; M.L.B. 1910

See patents quoted under C.I.76050

Beilstein, 13-I 204

Soluble in alcohol, water

Insoluble in caustic soda

 H_2SO_4 conc. — dark reddish blue; on dilution — dark red

Ferric chloride added to aqueous soln. — light brown → dark brown

76056 C.I. Oxidation Base 14A

Sulfate of C.I.76055

Soluble in water

76060 C.I. Oxidation Base 10

C.I. Developer 13

*p*-Phenylenediamine*Discoverer* — Erdmann 1888Erdmann, *GP* 47349 (*Fr.* 2, 498)*BIOS* Survey 27, 39*FIAT* 764, *FDX* 885 (*PB* 74763) — Ursol D*Beilstein*, 13, 63

Soluble in alcohol, water

Insoluble in caustic soda

 H_2SO_4 conc. — dark red; on dilution — bluish pink

Ferric chloride added to aqueous soln. — brown → dark reddish brown

76061 C.I. Oxidation Base 10A

Dihydrochloride of C.I.76060

FDX 885 (*PB* 74763) — Ursol DS, DSP

Soluble in water

Slightly soluble in alcohol (yellow)

 H_2SO_4 conc. — brown; on dilution — pale straw NaOH conc. — colourless; on dilution — colourless

Ferric chloride added to aqueous soln. — colourless → light brown

76065 Oxidation Base2-Chloro-*p*-phenylenediamine*Discoverer* — P. Onnertz 1921**Ursol Brown O (IG)**Agfa, *BP* 180905; *USP* 1434449*FDX* 885 (*PB* 74763) — Ursolbraun O*Beilstein*, 13, 117**76066 C.I. Oxidation Base 13A**

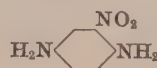
Sulfate of C.I.76065

Discoverer — P. Onnertz 1921Agfa, *GP* 376625*FDX* 885 (*PB* 74763) — Ursolbraun SO

Soluble in alcohol, water

 H_2SO_4 conc. — greenish grey; on dilution — brown NaOH conc. — colourless; on dilution — no change

Ferric chloride added to aqueous soln. — blue → yellowish brown

76070 C.I. Oxidation Base 222-Nitro-*p*-phenylenediamine*Discoverer* — M.L.B. 1907M.L.B., *GP* 211567 (*Fr.* 9, 854)*BIOS* Survey 27, 39*FIAT* 764, *FDX* 885 (*PB* 74763) — Ursolbraun RR 'F'*Beilstein*, 13, 120

Soluble in alcohol, water

 H_2SO_4 conc. — brown; on dilution — yellow NaOH conc. — reddish brown; on dilution — clear reddish brown

Ferric chloride added to aqueous soln. — reddish orange → black

76075 C.I. Oxidation Base 8

N,N-Dimethyl-*p*-phenylenediamine

Discoverer — Erdmann 1888

Erdmann, *GP* 47349 (*Fr.* 2, 498)

Beilstein, 13, 72

Soluble in alcohol, water

Slightly soluble in caustic soda soln.

H₂SO₄ conc. — brown; on dilution — light brown

Ferric chloride added to aqueous soln. — light brown → dark brown

76076 C.I. Oxidation Base 8A

Sulfate of C.I.76075

Erdmann, *GP* 47349 (*Fr.* 2, 498)

BIOS Survey 27, 39

FIAT 764, *FDX* 885 (*PB* 74763) — Ursolgrau AL 'F', DMG

Soluble in alcohol, water

Insoluble in caustic soda

H₂SO₄ conc. — dark red; on dilution — dark red

Ferric chloride added to aqueous soln. — dark reddish brown → dark yellowish brown

76077 C.I. Oxidation Base 8B

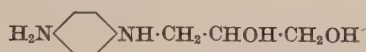
Oxalate of C.I.76075

Soluble in water

Slightly soluble in alcohol, caustic soda soln.

H₂SO₄ conc. — brown; on dilution — reddish brown

NaOH conc. — colourless; on dilution — colourless

76080 Oxidation Base

3-(*p*-Aminoanilino)-1,2-propanediol

Ursol W (IG)

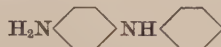
FDX 885 (*PB* 74763) — Ursol W

For preparation of base *see GP* 574003 (*Fr.* 19, 697)

76085 C.I. Oxidation Base 2

C.I. Developer 15

Classical name **Diphenyl Black**



N-Phenyl-*p*-phenylenediamine

Discoverers — Erdmann 1896; Ullrich and Fussgänger 1901

Erdmann, *GP* 92006

M.L.B., *BP* 15062/01; *FP* 313035; *GP* 134559 (*Fr.* 6, 1062)

R. Clavel, *BP* 194840; *GP* 402500 (*Fr.* 14, 1082)

Brit. Celanese, *BP* 255962

Fierz-David, 341

Note — For the stabilised diazo component *see* C.I.37240

Beilstein, 13, 77

76086 C.I. Oxidation Base 2A

Hydrochloride of C.I.76085

Erdmann, *GP* 92006

Agfa, *GP* 187681 (*Fr.* 9, 853)

BIOS Survey 27, 39

FIAT 1313, 1, 31

FIAT 764 — Ursolgrau B 'F'

FDX 885 (*PB* 74763) — Ursolgrau B 'F', BR, H

Soluble in alcohol, water

Insoluble in caustic soda soln.

H₂SO₄ conc. — reddish black; on dilution — bluish black

Ferric chloride added to aqueous soln. — brown → dark reddish black

76087 C.I. Oxidation Base 2B

Oxalate of C.I.76085

Soluble in water

Insoluble in caustic soda soln.

H₂SO₄ conc. — reddish black; on dilution — bluish black

Ferric chloride added to aqueous soln. — colourless → reddish brown

76088 C.I. Oxidation Base 3

4-Phenylimino-2,5-cyclohexadiene-Δ¹,*N*-sulfamic acid

Lantz, *Teintex*, 31 (1966), 185

Compare "Caro's Yellow Imine", under C.I. 76001

76090 C.I. Oxidation Base 27

FIAT 1313, 1, 43



Beilstein, 13, 381

N-(*o*-Methoxyphenyl)-*p*-phenylenediamine**76091 Oxidation Base**

Ursol Grey BBF (IG)

Hydrochloride of C.I.76090

FDX 885 (PB 74763) — Ursolgrau BB 'F'

76120 Oxidation Base

Discoverer — Erdmann 1897



Erdmann, GP 98431 (Fr. 5, 681)

4,4'-Diaminodiphenylamine

Beilstein, 13, 111

76121 Oxidation Base

Ursol Grey R (IG)

Dihydrochloride of C.I.76120

Agfa, GP 187322 (Fr. 9, 852)

FDX 885 (PB 74763) — Ursolgrau R

76125 Oxidation BasePreparation of base (*leuco Bindschedler's Green*)

Bindschedler, Ber. 16 (1883), 866

Nietzki, Ber. 16 (1883), 473

4,4'-Bis(dimethylamino)diphenylamine

Beilstein, 13, 112

76126 Oxidation Base

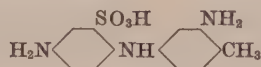
Ursol Grey G (IG)

Sulfate of C.I.76125

FDX 885 (PB 74763) — Ursolgrau G

76130 Oxidation Base

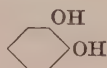
Ursol Leather Blue (IG)



FDX 885 (PB 74763) — Ursollederblau

5-Amino-2-(3-amino-*p*-toluidino)benzenesulfonic acid**76500 C.I. Oxidation Base 26**

Discoverer — Agfa 1913



Agfa, GP 276762 (Fr. 12, 545)

Pyrocatechol

Beilstein, 6, 761

Soluble in water

76505 C.I. Oxidation Base 31

Discoverer — M.L.B. 1903

C.I. Developer 4

M.L.B., GP 162625 (Fr. 8, 855)



Agfa, GP 276761 (Fr. 12, 543)

Resorcinol

Beilstein, 6, 796

Soluble in alcohol, water

H₂SO₄ conc. — brown; on dilution — yellow

NaOH conc. — colourless; on dilution — colourless

Ferric chloride added to aqueous soln. — yellowish brown

76510 Oxidation Base

Used as a component of mixtures — see Vol. 3, pp. 3265, 3266

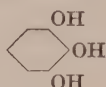


Beilstein, 6, 819; 6-II 818

4-Chlororesorcinol

76515 C.I. Oxidation Base 32

Discoverer — Bertram 1898



Bertram, GP 104662 (Fr. 5, 683)

Pyrogallol

Beilstein, 6, 1071

Soluble in alcohol, water

H₂SO₄ conc. — yellowish brown; on dilution — yellowish brown

NaOH conc. — brown; on dilution — reddish brown

Ferric chloride added to aqueous soln. — brown → dark brown

76520 C.I. Oxidation Base 17

o-Aminophenol

Discoverer — Agfa 1898
 Agfa, *GP* 103505 (*Fr.* 5, 682)
BIOS Survey 27, 39

Beilstein, 13, 355

76521 C.I. Oxidation Base 11

Copper salt of C.I.76520

Discoverer — Agfa 1898
 Agfa, *GP* 103505 (*Fr.* 5, 682)
BIOS Survey 27, 39
FIAT 764, *FDX* 885 (*PB* 74763) — Ursol GG, 3GN

Soluble in alcohol, water
 H_2SO_4 conc. — bluish red; on dilution — reddish orange
 NaOH conc. — dark red; on dilution — red
 Ferric chloride added to aqueous soln. — light brown → dark brown

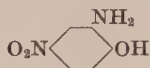
76525 C.I. Oxidation Base 18

2-Amino-4-chlorophenol

Discoverer — Agfa 1898
 Agfa, *GP* 103505 (*Fr.* 5, 682)
FIAT 1313, 1, 412
FDX 885 (*PB* 74763) — Ursolbraun PY

Beilstein, 13, 382

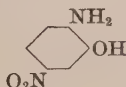
Soluble in alcohol, water
 Insoluble in caustic soda soln.
 H_2SO_4 conc. — dark blue; on dilution — maroon
 Ferric chloride added to aqueous soln. — colourless → dark reddish brown

76530 Oxidation Base

2-Amino-4-nitrophenol

Discoverer — Agfa 1898
Ursol 4GL (IG)
 Agfa, *GP* 103505 (*Fr.* 5, 682)
FIAT 1313, 1, 411
FDX 885 (*PB* 74763) — Ursol 4GL

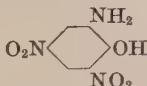
Beilstein, 13, 388

76535 Oxidation Base

2-Amino-5-nitrophenol

Discoverers — Kaltwasser and Oehrn 1920
Ursol Yellow Brown A (IG)
 Agfa, *BP* 183078; *GP* 362140 (*Fr.* 14, 1110)
FDX 885 (*PB* 74763) — Ursolgelbbraun A

Beilstein, 13, 390

76540 C.I. Oxidation Base 21

Picramic acid

Discoverer — Agfa 1898
 Agfa, *GP* 103505 (*Fr.* 5, 682)
FIAT 1313, 1, 412
FDX 885 (*PB* 74763) — Ursol 4R

Beilstein, 13, 395

Soluble in alcohol, water
 H_2SO_4 conc. — yellow; on dilution — greenish yellow
 NaOH conc. — reddish brown; on dilution — orange
 Ferric chloride added to aqueous soln. — reddish orange → yellowish brown

76545 C.I. Oxidation Base 7

m-Aminophenol

Discoverer — H. Schmid 1908
 Schmid, *GP* 210643 (*Fr.* 9, 858)
FIAT 1313, 1, 411
FDX 885 (*PB* 74763) — Ursol EG

Beilstein, 13, 402

Soluble in alcohol, water
 Insoluble in caustic soda soln.
 H_2SO_4 conc. — colourless; on dilution — colourless
 Ferric chloride added to aqueous soln. — colourless → brown

76550 C.I. Oxidation Base 6

p-Aminophenol

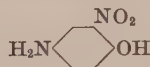
Discoverer — Erdmann 1888
 Erdmann, *GP* 51073 (*Fr.* 2, 499)
 Bertram, *GP* 104662 (*Fr.* 5, 683)
FDX 885 (*PB* 74763) — Ursol P base

Beilstein, 13, 428

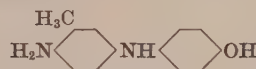
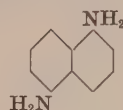
Soluble in alcohol, water
 H_2SO_4 conc. — dark blue; on dilution — dull yellowish red
 NaOH conc. — reddish brown; on dilution — violet
 Ferric chloride added to aqueous soln. — unchanged

76551 C.I. Oxidation Base 6A

Hydrochloride of C.I.76550

Erdmann, *GP* 51073 (*Fr.* 2, 499)
FIAT 1313, 1, 48, 411
FDX 885 (*PB* 74763) — Ursol PSoluble in alcohol, water
 H_2SO_4 conc. — reddish brown; on dilution — reddish brown
 NaOH conc. — brown; on dilution — brown
Ferric chloride added to aqueous soln. — light brown → dark brown**76555 C.I. Oxidation Base 25**

4-Amino-2-nitrophenol

BIOS Survey 27, 39
FIAT 764, *FDX* 885 (*PB* 74763) — Ursolbraun PR 'F'*Beilstein*, 13, 520**76560 Oxidation Base***p*-(*p*-Aminoanilino)phenol*Discoverer* — M.L.B. 1903**Ursol Blue Grey O, OX (IG)**M.L.B., *GP* 149676 (*Fr.* 7, 579)
FDX 885 (*PB* 74763) — Ursolblaugrau O, OX*Beilstein*, 13, 500**76565 Oxidation Base***p*-(4-Amino-*m*-toluidino)phenol*Discoverer* — M.L.B. 1908**Ursol Blue Grey OM (IG)**M.L.B., *GP* 209121 (*Fr.* 9, 855)
FDX 885 (*PB* 74763) — Ursolblaugrau OM*Beilstein*, 13, 504**76595 Oxidation Base**

1,5-Naphthalenediamine

Discoverer — Erdmann 1888Erdmann, *GP* 47349 (*Fr.* 2, 498)*Beilstein*, 13, 203**76600 Oxidation Base**

2,6-Naphthalenediamine

Discoverer — Erdmann 1888Erdmann, *GP* 47349 (*Fr.* 2, 498)*Beilstein*, 13, 208**76605 C.I. Oxidation Base 33**

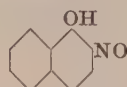
1-Naphthol

FIAT 1313, 1, 412*FDX* 885 (*PB* 74763) — Ursol ER, ERN*Beilstein*, 6, 596

Soluble in alcohol, water

 H_2SO_4 conc. — reddish brown → violet; on dilution — colourless NaOH conc. — dark green; on dilution — fluorescent

Ferric chloride added to aqueous soln. — pale brown ppt.

76610 C.I. Oxidation Base 15

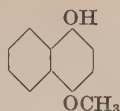
2-Nitroso-1-naphthol

Discoverer — M.L.B. 1903M.L.B., *GP* Appln. F 17445 (*Fr.* 7, 579)*Beilstein*, 7, 715

Soluble in alcohol, water

 H_2SO_4 conc. — yellowish brown; on dilution — yellow NaOH conc. — pale yellow; on dilution — yellow

Ferric chloride added to aqueous soln. — yellow → reddish brown

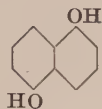
76620 Oxidation Base

4-Methoxy-1-naphthol

Ursol Grounding Blue BL (IG)

FIAT 764, FDX 885 (PB 74763) — Ursolgrundierblau BL

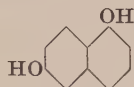
Beilstein, 6, 979

76625 Oxidation Base

1,5-Naphthalenediol

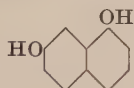
Discoverer — Erdmann 1918**Durafur Developer E (ICI)**Erdmann, GP 51073 (*Fr.* 2, 499)Agfa, GP 371231 (*Fr.* 14, 1111)

Beilstein, 6, 980

Used as a component of mixtures — *see* Vol. 3, pp. 3265, 3266**76630 Oxidation Base**

1,6-Naphthalenediol

Beilstein, 6, 981

76635 Oxidation Base

1,7-Naphthalenediol

Beilstein, 6, 981

For preparation of 1,7-naphthalenediol *see* I.G., BP 366600**76640 Oxidation Base**

2,6-Naphthalenediol

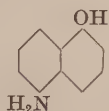
Beilstein, 6, 984

76645 Oxidation Base

2,7-Naphthalenediol

Discoverers — Kaltwasser and Kirberger 1921Agfa, GP 367690, 371233, 376624 (*Fr.* 14, 1112, 1112, 1113)

Beilstein, 6, 985

76650 Oxidation Base

5-Amino-1-naphthol

Discoverer — M.L.B. 1914M.L.B., GP 286339 (*Fr.* 12, 549)

Beilstein, 13, 670; 13-I 273

NOTES

INORGANIC COLOURING MATTERS

The use of inorganic colouring matters is very ancient, they being the first dyes or pigments for which we have any evidence of their use by man although we shall probably never be able to say with certainty whether or not the use of fruit juice or some other vegetable colouring matter did not precede the use of inorganic materials. There is no doubt, however, that use of synthetic inorganic colouring matters, e.g. Egyptian Blue, C.I.77437, preceded use of synthetic organic dyes and pigments by thousands of years. Huge quantities of both natural and synthetic inorganic colouring matters are still in daily use in industry.

A great many inorganic compounds and materials have potential use as dyes or pigments but relatively few have found any practical use and in compiling this section of the *Colour Index* no compound has been included unless there was evidence that it had been used as a commercial dye or pigment. Absence of any satisfactory comprehensive survey of the inorganic dyes and pigments, together with the fact that because many of them are not definite compounds they cannot be as precisely classified according to their chemical constitutions as can the organic colouring matters, rendered the task of compilation difficult. After much consideration it was decided that the best way to classify them was to list them under their metals in alphabetical order, or in the case of compounds containing more than one metal, under the metal mainly responsible for their colouring properties. The compounds of each metal are listed in the order metal (in the few cases where the metal itself is used as a pigment), the oxides, hydroxides and then the other compounds in the alphabetical order of their anions. Although carbon is not a metal and although the carbon blacks are really organic and not inorganic materials they are here treated in the conventional fashion as if they were inorganic materials.

Similar difficulties were met with in linking up the C.I. Generic Names and technical information for many of these materials, e.g. the iron oxides vary greatly in hue, dependent on their particle size and/or the conditions under which they were formed. Because of this information about hue is in very general terms, for when a compound can vary from pale yellow to deep brown using the same amount of pigment on the same substrate, no recourse can be made to classify by hue as can be done with organic dyes and pigments. Most of the natural inorganic dyes and pigments are mixtures of two or more compounds as are also a considerable number of the synthetic products. This is the reason why in some cases more than one C.I. Generic Name is given for a particular compound or for several compounds bearing the same C.I. Generic Name.

In some cases, e.g. C.I.77007, it has been found necessary to include notes on related materials which may differ considerably in hue from the main compound listed.

Literature

No really satisfactory survey from the chemical viewpoint has yet been made of the inorganic dyes and pigments and authoritative information about many of them is difficult to obtain; the following, however, cover at least the more important of these products.

Linton, W., *Ancient and Modern Colours, from the earliest to the present time: with their Chemical and Artistical Properties* (London, 1852). Deals with artists' pigments and contains a wealth of references to, and quotations from, classical Greek and Roman literature

Bersch, J., *The Manufacture of Mineral and Lake Pigments*, translated from the 2nd revised edition by A. C. Wright (London, 1901). Pp. 1-339 deal with inorganic pigments

Gentile and Buntrock, *Lehrbuch der Farbenfabrikation* (Braunschweig, 1906)

Weiner, *Ber.*, **40** (1907), 4441

Weinland, Stroh and Paul, *ibid.*, **55** (1922), 2706

Wagner, H., *Die Körperfarben* (Stuttgart, 1928)

Feitknecht, *Helv. Chim. Acta*, **13** (1930), 22; **16** (1933), 427, 1302; **18** (1935), 28, 40; **19** (1936), 448, 467, 831

Thomas, *Colloid Chemistry* (New York, 1934)

Rabaté, H., *Peintures, Pigments, Vernis*, **23** (1947), 44-50

Scholten, H. van Wüller, *Pigment — Tabellen* (Hannover, 1949)

Hey, M. H., *An Index of Mineral Species arranged chemically* (British Museum, 1950)

Thews, *Metal Finishing*, **49** (9) (1951), 80. Use of heavy metal cyanides in production of coloured gold plating

Scott and Audrieth, *J. Chem. Ed.*, **31** (1954), 168

Remington, J. S., and Francis, W., *Pigments, their Manufacture, Properties and Uses*. 3rd Ed. (London, 1954)

Bailar, J. C. (edited by), *The Chemistry of the Coordination Compounds*. A.C.S. Monograph No. 113 (New York, 1956)

BIOS 1272 — Synthetic Iron Oxides

BIOS 1402 — German manufacture of certain inorganic pigments

BIOS 1521 — White lead

FIAT 804 — Molybdate Orange Pigments

FIAT 811 — Chrome Yellow and other pigments at G. Siegle & Co.

FIAT 814 — German productions of some of the more important inorganic pigments

BS 2876 : 1957 — Powder Pigments for Artists' Use

INORGANIC COLOURING MATTERS ON TEXTILES

The following deal with the production of inorganic colouring matters either for or *in situ* on textiles

Crookes, W., *A Practical Handbook of Dyeing and Calico Printing* (London, 1874) contains a chapter on Mineral Pigments

Knecht, E., and Fothergill, J. B., *The Principles and Practice of Textile Printing*. 4th Ed. with emendments and notes by J. G. Hurst (London, 1952); 425-430

Knecht, E., Rawson, C., and Loewenthal, R., *A Manual of Dyeing*. 8th Ed. (London, 1925), **2**, 690-6

Parnell, E. A., *Dyeing & Calico-Printing* (London, 1849), 38-40, 167-177

77000 C.I. Pigment Metal 1

Metallic aluminium

(a) The waste from making aluminium foil is further stamped until reduced to powder or flake. It is then coated with stearic acid to prevent the particles sticking together and polished by brushes in a revolving cylinder. This also confers leafing properties especially after maturing.

(b) Finely divided aluminium is ground in eddy, hammer or ball mills in presence of >1% of a vegetable oil or fatty acid until the particles are 0.000001–0.00002 in. thick and 10–15 times that in length and breadth.

Coloured aluminium powders are usually made by treating the metal powder first with tannic acid and then with a basic dye.

The coarser grades are the more brilliant. Pastes in white spirit containing 70% aluminium are now available.

Aluminium Bronze powders are usually alloys containing ca. 90% of copper and 10% of aluminium.

Evaluation

Knoll, *Official Digest Federation Paint & Varnish Production Clubs* (318) (1951), 447

Literature

Aluminum Co. of America, *USP* 2591245
Carlfors A-B., *BP* 650818
Wray, *Org. Finishing*, 7 (1947), 7, 18
Wendon, *Paint*, 17 (1947), 373; 19 (1949), 265, 286; 20 (1950) 397; 22 (1952), 455; *JSDC*, 71 (1955), 125
Greenwood, *ibid.* 301
Salome, *Ind. vernice*, 2 (1948), 125
FDX 418 (*PB* 82166)
FD 3279/48
Schiller, *Amer. Paint J.* 36 (22) (1952), 82
Edwards & Wray, *Aluminium Paint and Powder*, 3rd Ed., London (1955)
Standards
BS 388:1964 Aluminium flake pigments (powder and paste) for paints
USA–AMS 3128c; Fed. Spec. TT–A–468a (1); ASTM D962–49; TT–P–320a (Pigment, aluminium powder and paste for paint); TT–P–340 [Pigment, bronze powder (for gold paint)]
Canada–1–GP–22c, 1–GP–24c
France AFNOR 1965 Aluminium pigments in paste form for paints; T31–008 and 009
Holland N1532
India IS 72 and 289
Poland C81008

77002 C.I. Pigment White 24

Aluminium hydroxide with varying amounts of basic aluminium sulfate

General formula $3\text{Al}_2\text{O}_3 \cdot \text{SO}_3 + 9\text{H}_2\text{O}$ there being ca. 8–10% of sulfate present calculated as SO_3

(1) Add soda ash or caustic alkali to aluminium sulfate or to potassium, sodium or ammonium alum, formation of basic sulfate, $\text{Al}_2(\text{SO}_4)_2 \cdot (\text{OH})_2$, being favoured by use of cold dilute solutions

(2) Fuse bauxite with soda ash, extract with hot water and pass carbon dioxide into the solution

Literature

BIOS 1402, 150
CIOS XXIII–19
Remington & Francis, 176

77004 C.I. Pigment White 19

Natural hydrated aluminium silicate, $\text{Al}_2\text{O}_3 \cdot 2\text{SiO}_2 \cdot 2\text{H}_2\text{O}$, containing calcium, magnesium or iron carbonates, ferric hydroxide, quartz-sand, mica, etc. as impurities

Occurs in Cornwall and Devon, France, Saxony, various parts of America and China, etc. Purified by levigation, dried to a stiff paste in settling tanks and then dried in kilns and cut into blocks

Bentonite or **Wilkinite** is found principally in Canada and the U.S.A.

Colloidal China clay peptised with alkalis and electrolysed using a positively charged drum to which the negatively charged pigment particles are attracted and from which they are scraped off, is sold under a variety of trade names

Alumina–China Clay frequently used as a base for colours for paper, is made either by adding China Clay to a suspension of alumina hydrate or by precipitating aluminium hydrate on China Clay

Literature

Remington & Francis, 67
Collins, *Chem. & Ind.* (1923), 2 Feb.

Standards

BS 1795:1957
USA ASTM D603–42
India IS 68, CDC 3(896) Kaolin for cosmetic industry. 1092
China clay for textile and paper industries.
S. Africa SABS 442

77007 C.I. Pigment Blue 29 (Bright violet → Bluish green)
C.I. Pigment Green 16 (component)

A polysulfide of sodium (or potassium, lithium or silver) aluminosilicate of unknown constitution. Its crystal structure resembles that of the zeolites and like them it has base exchange properties. Some of the sulfur is present as such and can be extracted with carbon bisulfide. Its colour is caused by the polysulfide linkage, which is in a highly resonant state. Replacement of the sulfur by selenium or tellurium gives pinks to browns and greys to blacks respectively

It was originally obtained by grinding the precious stone lapis lazuli and the natural product still finds use as an artists' pigment

Since 1828 made by fusing together kaolin, soda ash, Glauber's salt, sulfur, carbon and kieselguhr in absence of air at red heat for 7–10 hr. The resulting **Green Ultramarine**, C.I.77013, is cooled, ground, mixed with 7–10% of sulfur and "blued" by heating in a furnace. It is finally cooled, wet ground, levigated, ground and standardised. The hue of the product varies from pale greenish blue to violet depending on the silica-alumina ratio

Ultramarine Violet, C.I. Pigment Violet 15, obtained by heating Ultramarine with 5% of ammonium chloride at 200–250°C for 4 days or by heating Ultramarine with chlorine and hydrochloric acid. It is finally brightened by treating with dry steam, washed and dried at a low temperature. It can be represented approximately as $\text{Na}_5\text{HAl}_4\text{Si}_6\text{S}_4\text{O}_{24} + \text{H}_2\text{O}$ — Singer, *Z. anorg. Chem.* **204** (1932), 232

Ultramarine Red obtained by treating Ultramarine Violet with gaseous hydrochloric acid at 70–200°C for 4 hr. or at a higher temperature with gaseous nitric acid. It is the acid of which Ultramarine Violet is the sodium salt

Oriental Blue is a mixture of Ultramarine and Prussian Blue

Discoverer — Natural product ancient. Taessaert first observed formation of the synthetic product in the soda furnaces at St. Gobain in 1814. Synthesised by Gmelin in 1822, but first manufactured by Guimet in Lyons and Koettig in Meissen in 1828

Literature

Hoffmann, *Chem. Z.* **34** (1910), 821; **53** (1929), 953, 974; *Z. anorg. Chem.* **189** (1930), 91

J. Oil Col. Chem. Assocn. **2** (1919), 121; **8** (1925), 202

Jaeger, *Trans. Faraday Soc.* **25** (1924), 320

BIOS 1402, 1

Penot, *Peintures, Pigments, Vernis*, **24** (1948), 10

Powel, *JCS* (1948), 61

Prenner & Ward, *J. Amer. Chem. Soc.* **72** (1950), 2780

Agte, Libina, Miller & Musakin, *J. Appl. Chem. U.S.S.R.* **24** (1951), 1317

Kumins & Gessler, *Ind. Eng. Chem.* **45** (1953), 567

Kumins, *Am. Ink Maker*, **32** (5) (1954), 47; *Interchem. Rev.* **13** (1954), 3

Gardner & Fraenkel, *J. Amer. Chem. Soc.* **77** (1955), 6399

Remington & Francis, 72

Thorpe, **11**, 776

Ultramarines. Their History and Characteristics, Reckitts (Colours) Ltd., Hull, n.d.

Standards

BS 314:1968 Ultramarine Pigments Type 1 for paints, Type 2 for plastics and rubber, Type 3 as a blueing agent; BS 2876:1957 (French Ultramarine and Ultramarine genuine)

USA Fed. Spec. TT-P-450 Ultramarine blue, dry; TT-U-450 (2); ASTM D262-47

Egypt EOS 1963 408 Ultramarine Blue and Violets for paints

France T 31-003

Holland NEN 5270:1964 Pigments: test methods for Ultramarine Blue

India IS 55

Poland PN C81012

Sweden SIS 16 04 10

Reactions

Unaffected by alkali. Decomposed and decolorised by acids with liberation of hydrogen sulfide. Forms the yellow silver ultramarine when heated with silver nitrate, on treating with a sodium salt it becomes blue again

77009 C.I. Pigment Green 23 (Greenish grey → Olive)

Mainly a natural alkali-aluminium-magnesium-ferrous silicate of varying composition

As Green Earth a decomposition product of augite and hornblende in the Mendip Hills and in France, Bohemia, Cyprus, etc. Terra Verte, mined at Monte Baldo near Verona, owes its colour to glauconite, a hydrated silicate of iron, aluminium and potassium. Widely distributed in Germany, etc. as Green Sand and Green Stone

The crude mineral is sorted, adhering impurities removed and then dry, or more rarely wet, ground to yield a dull greyish to blackish green pigment. The hue was formerly improved by treating with very dilute hydrochloric acid but treatment with organic dyes is now used, their presence can usually be detected by extraction with alcohol

Literature

Remington & Francis, 176

Standard

BS 2876 : 1957 (Terre verte defined as natural earth containing both ferric and ferrous oxides)

77011 C.I. Pigment Black 18 (Grey → Black)

Carbonaceous hydrated aluminium silicate which may contain up to 30% of carbon. It may be represented as $\text{AlHSi}_2\text{O}_6 + \text{C}$

Occurs particularly pure in Spain and less pure in other parts of Europe. It is mined and the accompanying matrix removed by crushing, wet-grinding and levigation; the product is brownish to bluish black. A similar product containing ca. 15% of carbon is obtained in the U.S.A. by igniting bituminous shale in absence of air

Reactions

Partly soluble in mineral acids with separation of carbon

77013 C.I. Pigment Green 24

A double silicate of aluminium and sodium containing sulfur, constitution unknown but the pigment may be represented approximately as $\text{Na}_2\text{Al}_2\text{Si}_3\text{S}_2\text{O}_{12}$ or $\text{Na}_8\text{Al}_6\text{Si}_6\text{S}_2\text{O}_{24}$

The first product of ignition in the manufacture of Ultramarine by the indirect process (cf. C.I.77007) is levigated and ground. The Glauber's salt mixtures, in particular, give rise to yellowish Ultramarine Green, and well fitting lids and a reducing flame must be used. The temperature of the mix should be raised as quickly as possible and care taken that none of the reducing agent remains unaltered

Reactions

Decomposed by mineral acids with liberation of hydrogen sulfide

77015 C.I. Pigment Red 101 and 102

Mainly aluminium silicate coloured by ferric oxide

In beds and layers in many parts of Germany and in compact brownish-red lumps in Armenia, Lemnos, Malta and Central Europe

Usually sold in the natural state after superficial drying, but is occasionally levigated or calcined. It varies in hue from yellowish pink through brick red to brown

Reactions

Mineral acids dissolve out the ferric oxide

77017 C.I. Pigment Black 19 (Grey)

Hydrated aluminium silicate, AlHSi_2O_6

Standard

India IS 61

(1) Widely distributed in the Rhineland, Thuringia, etc.; it is crushed, ground and sometimes levigated

(2) Waste from trimming roofing slates is ground to a fine powder and levigated

(3) The distillation of grey shale leaves a grey ash used as a pigment for grounding paints

(4) **Filling Up** is a name given to products of greater covering power, obtained by calcining clays of this type containing hydrocarbons, nitrogen, sulfur, etc.

(5) **Black Chalk** is a clay containing appreciable amounts of carbonaceous matter

Reactions

Decomposed and partly dissolved by mineral acids

77019 C.I. Pigment White 20 and 26

Aluminium potassium silicate, $\text{H}_2\text{KAl}_3(\text{SiO}_4)_3$

Literature

Remington & Francis, 65

Mica The above is *muscovite* the most generally used form of mica in the paint trade but others used include *phlogopite* (a potassium magnesium aluminium silicate), *biotite* (magnesium iron aluminium silicate) and *lepidolite* (aluminium lithium silicate)

White muscovite comes mostly from India but it is also found in Siberia, U.S.A., Peru and Norway. The mineral is wetground, the heavy material allowed to settle out, the finer material passed along to another settling tank after which it is filtered and dried

Mica has good leafing properties

Pumice A highly vesicular lava varying in composition according to origin but mainly composed of complex silicates of aluminium, potassium and sodium

Pumicite is a whitish powdery volcanic ash, mined extensively in the U.S.A.

Standards

BS 1795:1965 Mica

Mica, USA ASTM D607-42

Spain UNE 48:176 (Mica for paints and enamels)

Pumice, USA ASTM D716-45

77050

Antimony

Treat an acid solution of an antimony salt to precipitate the antimony as a fine black powder known as **Antimony** or **Iron Black**, cf. C.I.77060

Used to impart the appearance of polished steel to papier mâché and plaster of Paris

77052 C.I. Pigment White 11

Antimonious oxide Sb_2O_3

Literature

Price, J. *Oil Colour Chem. Assocn.* 26 (1943), 99

Remington & Francis, 55

Occurs naturally as white antimony, antimony bloom and valentinite

Manufacture (1) Gently roast grey antimony or native antimony sulfide and fuel in a fine powdered moist state in air. The sulfur is eliminated as sulfur dioxide and the antimonious oxide is sublimed as a brilliant white pigment. Heating must not be carried too far or antimony tetroxide, Sb_2O_4 , may be formed. By varying the temperature products ranging from pure white to dull orange may be obtained

(2) Volatilise and oxidise purified antimony metal. As the oxide is volatile the vapours must be cooled rapidly or a coarse crystalline product useless as a pigment is obtained

Antimony White is seldom used alone and the pigments sold under that name in the U.K. are usually mixtures of antimonious oxide and zinc oxide, C.I.77947, sometimes with addition of barytes, C.I.77120

Antimony tetroxide Sb_2O_4 is used as an opacifier in enamels

Standards

BS 239-338:1967

U.S.A. Fed. Spec. TT-A-566

Australia K 50

Holland V 1337 and N 1942, N 1952, NEN 1962:1942 (Methods of test for Antimony oxide)

India IS 38

Pakistan PS 109:1960

Solubility

Slightly soluble in water, readily soluble in hydrochloric acid but insoluble in dilute nitric or sulfuric acids

Reactions

Turns yellow on heating but goes back to white on cooling

77055

Antimony oxychloride SbOCl

Powder of Algaroth

Dissolve antimony trisulfide in strong hydrochloric acid, pour into water and wash the precipitate until the rinsewater is no longer acid. Used as a smoke producer

77056Antimony trichloride SbCl_3

Dissolve antimony sulfide in strong hydrochloric acid in presence of a trace of nitric acid and evaporate to dryness. Used for bronzing iron and colouring zinc black

Solubility

Soluble in water

77060 C.I. Pigment Red 107Antimony trisulfide Sb_2S_3

Occurs naturally as black Stibnite, also known as Antimonite, Antimony glance or Grey Antimony

The synthetic product is yellow to deep crimson and is made by

(1) Heat together solutions of a soluble antimony salt and sodium thiosulfate. A yellow precipitate forms at 32°C which becomes scarlet when filtered off, washed and dried

(2) Heat together solutions of calcium thiosulfate and antimony trichloride at $60\text{--}70^\circ\text{C}$. The precipitate changes in hue through straw-yellow, lemon-yellow, orange-red to deep crimson, and is then washed and dried at below 50°C

It is also obtainable from hot solutions in an anhydrous greyish-black form known as **Antimony Black**, cf. C.I.77050

Antimony Glass or **Vitreous Antimony** or **Antimonial Glass** — a vitrified product of variable composition obtained by partial roasting and subsequent fusion of antimony trisulfide to yield a transparent dark ruby-red mass used for tinting glass and porcelain yellow

Discoverer — Antimony vermilion was introduced by Murdoch in 1847

*Literature*Parnell, *Dyeing & Calico-Printing* (London 1849), 38Krause, *Przemysl Chem.* **32** (1953) 3

Bersch, 178

Reactions

Dissolves in concentrated mineral acids and alkalis and in dilute aqueous ammonium sulfide. Blackens and melts on heating

77061Antimony pentasulfide Sb_2S_5

Antimony Red or **Antimony Sulfide Golden** is used as a red pigment in oil and water colourings and for colouring rubber

Solubility

Insoluble in water, soluble in alkalis

77085 C.I. Pigment Yellow 39Arsenic disulfide As_2S_2

Occurs naturally as *realgar* which on exposure to light disintegrates to a reddish yellow mixture of As_2S_3 and As_2O_3 with some As_4S_3

The synthetic product is made in various ways, e.g.

(1) Fuse a mixture of white arsenic, sulfur and charcoal

(2) Sublime a mixture of arsenious oxide and sulfur

(3) Distill a mixture of pyrites and an arsenical ore

King's Yellow or **Old King's Yellow** was originally arsenic disulfide but now a mixture of cadmium sulfide, C.I.77199, and zinc oxide, C.I.77947, is sold under that name

*Literature*Ito, Morimoto & Sadanaga, *Acta Cryst.* **5** (1952), 775Schafer, *J. Amer. Oriental Soc.* **75** (1955), 73

Bersch, 129

77086 C.I. Pigment Yellow 39Arsenic trisulfide As_2S_3

Occurs naturally as *orpiment*

The synthetic product is made in various ways, e.g.

(1) Precipitate an acid solution of arsenious oxide with hydrogen or sodium sulfide

(2) Heat white arsenic with sulfur

The commercial product is mainly arsenious oxide with 2.7–3.4% arsenic trisulfide

*Literature*Parnell, *Dyeing & Calico-Printing* (London 1849), 39Morimoto & Sadanaga, *Acta Cryst.* **5** (1952), 775

77087Arsenic pentasulfide As_2S_5

Precipitate arsenic acid dissolved in hydrochloric acid with hydrogen sulfide or decompose a sulfoarsenate

Used as a yellow-orange pigment in paints and in pyrotechnics

77099 C.I. Pigment White 10Barium carbonate BaCO_3

Occurs naturally as *witherite* in Durham and Northumberland

Synthetic barium carbonate prepared by precipitation, e.g. by interaction of barium sulfide and soda or carbon dioxide, is softer and finer than witherite

*Literature*Muddiman, *J. Oil Colour Chem. Assocn.* **25** (1942), 127

BIOS 1104

Standard

BS 1795:1957 Precipitated barium carbonate

Japan JIS K1415:1961 (Barium carbonate)

77103 C.I. Pigment Yellow 31 (*Dull greenish yellow*)

Barium chromate BaCrO_4

(1) Mix simultaneously solutions of 200 parts potassium chromate in 400 water and 250 barium chloride in 750 water with a large quantity of water, filter off the precipitate, wash and dry

(2) Pour aqueous sodium dichromate into a slight excess of aqueous barium chloride, adding sodium acetate during the precipitation, wash, filter and dry

Discoverer — Vauquelin 1809

Literature

Vauquelin, *Ann. de Chimie*, **70** (1809)

BIOS 1402, 134

Bersch, 152

Standards

BS 2876 : 1957

DTD 369 A : 1939

Solubility

Soluble in dilute mineral acids and alkalis

Reactions

Decomposes on heating to yield a green pigment which is a compound of barium and chromium oxides occasionally used as an artists' colour

77106 C.I. Pigment Yellow 31:1

Barium potassium chromate $\text{BaK}_2(\text{CrO}_4)_2$

Treat barium chromate with potassium dichromate at high temperature

To some extent acts as a drier. Used in corrosion resisting paints it hydrolyses slowly to release only potassium chromate leaving the barium chromate behind as a residual coating

Literature

Prigotski & Kastens, *Ind. Eng. Chem.* (1949), November

Eickhoff & Kebud, *Official Digest Fed. Paint & Varnish Prod.*

Clubs (1949), 291

77110

Barium manganate BaMnO_4

A green pigment obtained by heating manganese dioxide with barium carbonate or nitrate or precipitating potassium manganate with barium chloride

Literature

Chevillot & Edwards, *Ann. Chem. Phys.* **4**, 827; **8**, 337

Bersch, 270 (Manganese Green, Rosenstiehl's Green),

271 (Böttger's Green), 272 (Manganese Blue)

Standard

BS 2876 : 1957 (Manganese blue defined as barium manganate on a barium sulfate basis)

77112 C.I. Pigment Blue 33

Mixed crystals of 11% BaMnO_4 and 89% BaSO_4

(1) Run a mixture of nitric acid (34.92% by wt.), sulfuric acid (55.98) and water (9.10) into a tiled vat and stir in enough powdered barium carbonate to neutralise the acid, and then solid barium hydrate and potassium permanganate until a thick blue paste is produced. This is then fused, treated with hydrochloric acid, ground, washed, filtered and dried

(2) Heat a mixture of Blanc Fixe, C.I. 77120, pyrolusite and barium nitrate at 680–700°C for 30 min., grind, wet mill, treat with hydrochloric acid, wash, treat with caustic soda, wash, treat with phosphoric acid and hydrogen peroxide, wash, filter and dry

(3) Ignite a mixture of manganese oxide, barium nitrate, kaolin and silica at red heat. It is a clear sky blue pigment

Literature

BIOS 1402, 157

Korinth, *Angew. Chem.* **64** (1952), 265

77115 C.I. Pigment White 5

Complex co-precipitate, but not a compound, of barium sulfate and zinc sulfide

Treat slight excess of aqueous zinc sulfate with aqueous barium sulfide, wash and dry, calcine at 700°F in absence of air, quench in water, wash, dry and grind

Discoverer — G. F. de Doubet ca. 1850. First produced on a large scale in 1874 by J. B. Orr

Literature

Steinau, *Chem. Z.* **45** (1921), 741
Morris, *Paint, Oil & Chem. Rev.* **85** (22) (1928); **87** (23) (1929); **89** (16) (1930)
Mills, *J. Oil Col. Chem. Assocn.* **19** (1936), 107; **34** (1952), 497
Volquartz, *Farben, Lacke, Anstrichstoffe*, **2** (1948), 33
Anders, *Deut. Farben Z.* **6** (1952), 175
Rigg, *J. Oil & Col. Chem. Assocn.* **39** (1956), 809 (History, Manufacture, and Uses of Lithopone)
Remington & Francis, 40, 275
Thorpe, **9**, 627

Standards

BS 239 . . 296:1967
USA Fed. Spec. TT-L-426; ASTM D477-45 (Zinc sulfide pigments — lithopone)
Argentina IRAM 1004
Australia K 20
Belgium NBN 265 and suppl.
France T 31-007
Germany DIN 55910
Holland NEN 680, 879 and 880
Hungary MNOSZ 814
India IS 37
Mexico DGN K 44
Pakistan PS108:1960
Poland PN C81016
Spain UNE 1956 48040
Sweden 16 00 15 and 16 04 04
Yugoslavia JZS H.C1. 021 Inorganic Pigments: Lithopone

Reactions

Dissolves in mineral acids with evolution of hydrogen sulfide

77117 C.I. Pigment Yellow 35

Prepared from cadmium sulfate and barium sulfide

Literature

Ward, *J. Oil Col. Chem. Assocn.* **10** (1927), 4
Mosa & Cuppini, *Pittura e Vernici*, **6** (1950), 141
Remington & Francis, 118

Standards

USA Fed. Spec. TT-C-83
India IS 52

77120 C.I. Pigment White 21, 22

Barytes

Occurs naturally in extensive deposits in England and Europe usually as compact masses varying in colour and purity, the usual impurities being sulfides. It is first sorted into white, reddish and yellowish qualities, washed with water, dried and ground three or four times. Some qualities are levigated. Products with a reddish or yellowish hue may be blued with Ultramarine, C.I.77007, or if the colour is due to iron they may be bleached with hydrochloric acid

Blanc Fixe

The synthetic product is prepared by treating aqueous barium chloride with sulfuric acid or sodium or magnesium sulfate. The character of the product varies with the precipitant, with acid it is more crystalline and settles rapidly whereas with salts it settles slowly and the supernatant liquor remains milky. A less pure product is obtained as a by-product in the manufacture of hydrogen peroxide

Literature

BIOS 1140

Standards

BS 1795:1965 Precipitated barium sulphate
USA ASTM D602-42
Argentina IRAM 1008 and 1010
Chile *Inditeknor* 1960-39.8d and 39.9
Germany DIN 55911
Holland NEN 1962:1943 (Methods of test for Barium sulphate)
India IS 64 and 65, 1960 1683 Barytes for the rubber industry
Poland PN C 607

77122 C.I. Pigment White 23

Co-precipitate of approx. 25% aluminium hydroxide and 75% barium sulfate

Alumina Blanc Fixe

Mix 10% solutions of soda ash and aluminium sulfate and then add excess of 10% aqueous barium chloride at 40°C, wash well, filter and dry

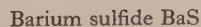
Blancopone, used as a base for colours, is approx. 70% barium sulfate and 30% calcium carbonate, C.I.77220

Literature

Remington & Francis, 178
BIOS 1402, 155

Reactions

Mineral acids and caustic alkalis dissolve the aluminium hydroxide leaving behind barium sulfate

77125

Reduce barium sulfate by heating it with powdered coal, and leach with water. The resulting solution consists really of barium hydrosulfide and some hydroxide

Used as a water-soluble phosphorescent pigment

77128 C.I. Pigment White 13Barium tungstate BaWO_4

Precipitate sodium tungstate with barium acetate

Literature

Kahlbaum, *GP* 91605
Soc. Scheurer & Lauth, *FP* 253741
Anthon, *J. pr. Ch.* 9 (1874), 337
Schreiber, *ibid.* 83 (1911), 237
Lefort, *Ann. Chim. Phys.* 15 (5), 325
Zerr & Rubenkamp, 3rd Ed. 339
Rose, *Mineralfarben*, 379
Wagner, *Die Körperfarben*, 197
Plessow, 223
Gentele, 3rd Ed. 2, 141

77130Barium diuranate $\text{Ba}_3\text{U}_2\text{O}_7$

Used for colouring porcelain

77160Bismuth trioxide Bi_2O_3

Ignite bismuth nitrate to obtain a yellow ceramic colour

77163 C.I. Pigment White 14 and 31Bismuth oxychloride BiOCl **Blanc de Perle** Precipitate aqueous bismuth nitrate with dilute hydrochloric acid**Blanc d'Espagne** Mix aqueous bismuth nitrate with brineA pigment of the bismuth oxychloride type forms the basis of **C.I. Pigment White 31** used in various plastics as substitutes for Pearl Essence (C.I. Natural White 1)*Reactions*

Decomposes with evolution of chlorine when heated in air, but in absence of air turns yellow and melts without decomposition

77166Bismuth basic dichromate $\text{Bi}_2\text{O}_3 \cdot 2\text{CrO}_3$

Precipitate bismuth nitrate with potassium dichromate

Used as an orange red pigment

Solubility

Insoluble in water, soluble in acid and alkali

77169 C.I. Pigment White 17Basic bismuth nitrate $4\text{BiNO}_3(\text{OH})_2 \cdot \text{BiO}(\text{OH})$

Dissolve bismuth in fuming nitric acid and pour the solution into a large volume of water. When freshly prepared it is a brilliant white but soon yellows on exposure to air

Literature

Bersch, 130

Reactions

Decomposes on heating. Blackened by hydrogen sulfide

77172Bismuth sulfide Bi_2S_3 Used as a brownish black hair dye by double decomposition between a bismuth salt and sodium thiosulfate *in situ**Literature*Cox, *Chem. & Ind.* 55 (1936), 780; *Analyst*, 63 (1938), 397
(Analysis of bismuth compounds used as hair dyes)

77180

Cadmium

Obtained as a by-product in the production of lead and zinc

Used in the U.S.A. as a white pigment; protects iron and steel against atmospheric corrosion. As it is not so readily corroded as zinc it is at times added to zinc dust used as an anti-corrosive pigment

*Literature*Wilson & Wick, *Ind. Eng. Chem.* 29 (1937), 1164

77185Cadmium acetate $\text{Cd}(\text{CH}_3\text{COO})_2 \cdot 3\text{H}_2\text{O}$

Used as a white pigment in ceramics (iridescent glazes)

77188 C.I. Pigment Yellow 44Basic cadmium chromate $\text{Cd}_2(\text{OH})_2\text{CrO}_4$

Precipitate boiling aqueous cadmium sulfate with potassium dichromate

*Literature*Freese, *Ber.* 2 (1869), 478

Cadmium nitrate $\text{Cd}(\text{NO}_3)_2 \cdot 4\text{H}_2\text{O}$

A white compound used for colouring glass and porcelain

77196 C.I. Pigment Orange 20
C.I. Pigment Red 108

Cadmium selenide CdSe

Usually a red powder but grey to brownish black forms are known

Some commercial varieties of **Cadmium Orange** are an impure form

Literature

BIOS 1402, 176

FIAT 814, 20

Ward, *J. Oil Col. Chem. Ass.* **10** (1927), 3, 40

Curtis & Wright, *ibid.* **37** (1954), 30

Standard

USA Fed. Spec. TT-C-80 [Cadmium red (cadmium lithopone) dry paint pigment]

77199 C.I. Pigment Orange 20 (Yellowish orange to
Reddish orange)
C.I. Pigment Yellow 37 (Bright yellow → Reddish yellow)
C.I. Pigment Green 14 (component)

Cadmium sulfide CdS

Occurs naturally as the somewhat rare mineral greenockite

The synthetic product is made in various ways, e.g.

(1) Precipitate a neutral or faintly alkaline solution of a cadmium salt with a sulfide; pale pigments are obtained from ammonium monosulfide and cadmium oxalate and dark colours from sodium monosulfide and cadmium carbonate

(2) Fuse cadmium oxide or carbonate with sulfur

(3) Vaporise cadmium and sulfur in absence of air

(4) Melt sodium thiosulfate in its own water of crystallisation, add cadmium sulfate and zinc oxide and calcine at 400–500°C

The hue varies from lemon yellow to orange red depending not on the orientation of the atoms or the lattice structure but on secondary factors related to the structure of the colloidal aggregates largely determined by the valency of the coagulating anion

Literature

Richard & Roeffer, *GP* 100876, 105007

BIOS 1402, 176

Remington & Francis, 117

Zapremetor & Prikhod'ko, *Kolloid Zhur.* **10** (1948), 15

Severgini-Schinetti, *Pittura e vernici*, **5** (1949), 23

Stock & Ledermann, *Deut. Farben-Z.* **7** (1953), 87

Krause, *Przemysl Chem.* **32** (1953), 3

Curtis & Wright, *J. Oil Col. Chem. Assocn.* **37** (1954), 26

Knecht & Fothergill, 426

Standard

BS 2876 : 1957 (Cadmium yellows, Cadmium orange)

Reactions

Dissolves with complete loss of colour in mineral acids. Turns dark violet red on heating but original hue returns on cooling if the pigment has not been oxidised

77201 C.I. Pigment Orange 23
(Yellowish orange → Reddish orange)
C.I. Pigment Red 113 (Yellowish red → Bordeaux)

Cadmium sulfide-mercuric sulfide $\text{CdS} \cdot x\text{HgS}$ obtained by co-precipitation of the sulfides and then calcining. The hue becomes redder and deeper the greater the HgS content

Patents (Manufacture)

BP 815328. Johnson, Matthey & Co.

USP 2878134. Imperial Color Chemical & Paper Corp.

77202 C.I. Pigment Red 108 (note)

Cadmium sulfo-selenide $\text{CdS} \cdot x\text{CdSe}$

Precipitate cadmium sulfate with soda ash. Add selenium metal dissolved in sodium sulfide to the precipitate, filter and calcine. The hue varies from orange to maroon becoming redder as the proportion of selenium increases, maroon being obtained with equimolecular quantities

Red Cadmium Lithopones are obtained by co-precipitating cadmium sulfo-selenide with barium sulfate

Literature

Remington & Francis, 119

Niederlander, *Chem. Z.* (1893), 1505

Erbner, *Farben Z.* **32** (1927), 2308

J. Amer. Ceram. Soc. **13** (1930), (5), ii, 44

BIOS 1402, 181

Neville, *Thorpe*, **10**, 710

Artamonov, *J. Appl. Chem. U.S.S.R.* **23** (1950), 847

Yamauchi & Endo, *J. Ceram. Assocn. Japan*, **60** (1952), 417

Curtis & Wright, *J. Oil Col. Chem. Assocn.* **37** (1954), 26

Standard

BS 2876 : 1957 (Cadmium orange, red, scarlet, deep red)

77208

Cadmium tungstate CdWO_4

Used in the U.S.A. in fluorescent paints

Solubility

Soluble in alcohol

77220 C.I. Pigment White 18

Calcium carbonate CaCO_3

Occurs extensively in many countries as chalk, limestone, marble and numerous varieties of calcspar. Purified according to natural condition by weathering in large piles, levigating, grinding, etc.

The synthetic product is made by

(1) Precipitate a calcium salt (free from iron) with soda ash

(2) Slake quick lime (iron free) with excess water and expose the paste in thin layers to the atmosphere until absorption of carbon dioxide is complete

Standards

BS 1795:77220 precipitated calcium carbonate, whiting

USA ASTM D119-52T

India IS 63; 1960 1685 Whiting for the rubber industry

Israel SI 410:1963 Pigments for paints: ground mineral calcium carbonate

S. Africa SABS 412

Spain UNE 48:179 (Chalk and Calcium Carbonate pigments for the manufacture of paints)

Literature

Remington & Francis, 63

Bull. Br. Whiting Res. Lab. Dec. 1953

Thorpe, **9**, 680

77223 C.I. Pigment Yellow 33Calcium chromate $\text{CaCrO}_4 \cdot 2\text{H}_2\text{O}$ Basic calcium chromate $\text{Ca}_2(\text{OH})_2\text{CrO}_4 \cdot 2\text{H}_2\text{O}$

Mix aqueous solutions of potassium chromate and calcium chloride, the higher the temperature the deeper the hue of the product

Literature

Udy, *BP* 666466; 666628
Bersch, 151

Standard

DTD 495

Solubility

Relatively soluble in water

77230 C.I. Pigment White 28

Calcium silicate

Standard

BS 1795:1965

77227 C.I. Pigment Brown 10Calcium orthoplumbate Ca_3PbO_4

Heat calcium carbonate with litharge. The hue of the product can be varied at will from white to dark reddish buff by very slight variations in the proportions of chalk and litharge used. These variations in colour cannot be imitated by mechanical mixtures. Any excess lead is present as the reddish brown lead calcium plumbate

*Literature*Read, *J. Oil Col. Chem. Assocn.* **33** (1950), 295*Standard*

BS 3699:1964 (Calcium plumbate for paint)

Reactions

Decomposed by hot water

77231 C.I. Pigment White 25Calcium sulfate $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$

Occurs extensively throughout the world as anhydrite (anhydrous rhombic crystals) but more usually as selenite (monoclinic crystals with two molecules of water of crystallisation). The hydrated form also occurs as the fibrous satinspar and as the granular crystalline alabaster

The synthetic product is made by

- (1) Treat calcium chloride with sulfuric acid
- (2) Add milk of lime to aqueous aluminium sulfate and shade, if necessary, with a blue dye

Literature

Cobenzl, *Chem. Z.* **44** (1920), 661
Smits, *JCS* (1926), 2655
Remington & Francis, 67
Bersch, 131 (Annaline)

Standard

India IS 69

Solubility

Slightly soluble in water

Reactions

On adding excess alcohol to its hydrochloric acid solution a flocculent white precipitate forms

Annaline was a strongly calcined gypsum

77233 C.I. Pigment White 5 (note)

Complex co-precipitate, but not a compound, of calcium sulfate and zinc sulfide

Calcine the precipitate from zinc sulfate and calcium sulfide at 700°C in absence of air and quench with water

77235 C.I. Pigment White 33Calcium sulfoaluminate $3\text{CaO} \cdot \text{Al}_2\text{O}_3 \cdot 3\text{CaSO}_4 \cdot 31\text{H}_2\text{O}$

- (1) Add concentrated aqueous alum to lime paste
- (2) Spray 10% aqueous alum into a slurry containing 5% lime
- (3) Add solid quick or slaked lime to a 1–5% solution of 30–90% of a stoichiometric amount of aluminium sulphate with vigorous stirring, then add the remainder of the aluminium sulphate also in dil. soln

Literature

Feldmühle *BP* 1128795
Remington & Francis, 177

77245 C.I. Pigment White 9Calcium sulfide CaS

Strongly heat calcium sulfate and charcoal

Its initial brightness is lower than that of the zinc sulfide type of phosphorescent material but the afterglow is longer at very low levels of brightness. The resistance to weather is rather higher than that of the strontium sulfide type

*Literature**BIOS* 814, 65*Standard*

BS 1316:1946 (Calcium sulfide type of fluorescent and phosphorescent material)

Solubility

Slightly soluble in water with partial decomposition

77250Calcium tungstate CaWO_4

Gradually add finely powdered tungsten to fused potassium carbonate so long as effervescence occurs. Boil the mass with water and add calcium chloride. Add the moist precipitate of calcium tungstate to hot dilute nitric acid until the liquid is only slightly acid, boil for 30 min., cool, wash the deep lemon yellow precipitate with water and dry

*Literature**Bersch*, 157 (Tungsten Yellow)

77265 C.I. Pigment Black 10 (Greyish black with metallic lustre)

Carbon crystallised in a hexagonal system characterised by perfect cleavage parallel to the basal pinacoid

Graphite occurs in various forms and degrees of purity widely distributed in veins in granite, gneiss, micaceous schist, etc, in many parts of the world. Ceylon Blacklead is the purest variety and contains 1.2–6.0% of ash whereas the poorest qualities, e.g. Swedish Blacklead, contain 40–60% of ash. The ash can be reduced to 1–2% by treating with mineral acid, fusion with alkalis, etc.

Synthetic graphite is obtained, together with carborundum, by heating anthracite, coke or charcoal with about 3% of iron in an electric furnace at a high temperature

Discoverer — Gessner in 1565

Literature

- Mène, *Compt. rend.* **64** (1867), 1091
Moissan, *The Electric Furnace*, London, 1904
Dona, *Der Graphit*, Leipzig, 1904
Haenig, *Der Graphit*, Wien, 1910
Spence, *Graphite*, *Dept. of Mines Pub.* 511, Ottawa, 1920
Taylor & Selvig, *U.S. Bureau of Mines Bull.* 112, Washington, 1920
Graphite, Imperial Mineral Resources Bureau, London, 1923
Kay, *Oil & Colour Tr. J.* **73** (1928), 662
Lipson & Stokes, *Proc. Roy. Soc. A* **181** (1942), 101
Hoerni & Weigle, *Nature*, **164** (1949), 1088
Hoerni, *ibid.* 1045
Arnold, *Z. angew. Physik*, **7** (1955), 453 (58 references)
Lukesh, *Phys. Rev.* **84** (1951), 1068
Remington & Francis, 164
Reynolds, *Physical properties of graphite*, Amsterdam and London, 1968

Standards

- India IS 62
Poland PN C 613

77266 C.I. Pigment Black 6 and 7

Almost pure carbon

Obtained by the incomplete combustion of hydrocarbon oils or gases or by cracking hydrocarbon gas under pressure. The hue varies from deep brownish or bluish or greyish to deep black. Carbon Black is much better in colour and tinctorial value than Lamp Black; the difference between their structures is not completely understood. Carbon blacks are often known by the name of the hydrocarbon they are made from, e.g. **Acetylene Black** or **Benzol Black**

Literature

- One of the oldest pigments known being used by prehistoric man, e.g. in cave paintings
Bone, *Phil. Trans.* (1915), 215, 275
Perrott & Thiessen, *J. Ind. Eng. Chem.* **12** (1920), 324
Neal & Perrott, *U.S. Bureau Mines Bull.* 192 (1922)
Mantell, *Industrial Carbon*, London (1928)
Dawson & Hartshorn, *Trans. Inst. Rubber Ind.* **5** (1930), 48
Francis, *Ind. Eng. Chem.* **23** (1931), 612
Warren, *J. Chem. Phys.* **2** (1934), 551
Bleyden & Riley, *JSCI*, **54** (1935), 159T
Drogin, *India-Rubber J.* **90** (1935), 259
Dittrich, *Brennstoff.-Chem.* **16** (1935), 121
Chem. Tr. J. **99** (1936), 153
BIOS 1274, 9
FIAT 1186
FDX 598 (PB 73659)
Duffy, *Am. Ink Maker*, **26** (1948), 11, 23; *Off. Dig. Fed. Paint & Varnish Prod. Clubs*, **312** (1951), 28
Wotschke & Paasch, *Schweiz. Arch. angew. Wiss. Tech.* **15** (6) (1949), 176
Jones, Kennedy, Spolan & Scott, *U.S. Bur. Mines, Rept. Invest.* No. 4695 (1950)
Amon, *Trans. Inst. Rubber Ind.* **26** (1950), 177
Ruess, *Ciencia e Invest.* (Buenos Aires), **6** (1950), 257
Norris, *International Chem. Eng.* **31** (1950), 543
Endter, *Z. anorg. allgm. Chem.* **263** (1950), 191
Kiddoo, *Chem. Engineering*, **58** (3) (1951), 104
Sweitzer, Venuto & Estelow, *Paint, Oil & Chem. Review*, **115** (8) (1952), 22
Shearon, Reinke & Ruble, *Ind. Eng. Chem.* **44** (1952), 685
Venuto, *Paint*, **24** (1954), 197
Remington & Francis, 153 (Carbon Black), 159 (Lamp Black)
Bibliography on Soot, Lamp Black and Carbon Black, TIDU 3961, Dept. Scientific & Industrial Research (T.I.D.U.), London (1956)

Standards

- BS 1014 : 1942 (Carbonaceous black pigments for cement, etc.)
BS 284 : 1952 (Carbon Black for paints)
BS 286 : 1952 (Lamp or Vegetable Black for paints); BS 2876 : 1957
USA ASA K 26-1 (Lampblack); ASTM D84-41; Fed. Spec. TT-L-70 (1); Fed. Spec. TT-L-706 (Lamp Black, dry, paint pigment); USA TT-P-343 Carbon-black dry
USA Fed. Spec. TT-C-120 (1) (Carbon-black)
Argentina IRAM 1021 (Lamp Black) and 1057 (Carbon Black)
Egypt EOS 1963 467 Black Carbon pigments for paint
Holland NEN 1531:1903 (Pigments: Methods of test for Carbon Black)
India IS 40, 42 and 43
Poland PN C 616

Testing

Dutch Standard N 1531

77267 C.I. Pigment Black 9

A mixture of 10% carbon, 78% of calcium phosphate, 8% of calcium carbonate together with small quantities of calcium sulfate, magnesium phosphate, calcium sulfide, soluble salts, etc.

Carbonise bones or the spent animal charcoal used for decolorising molasses

Drop Black is residual bone black from sugar refining, washed and ground

Literature

- Wilkins, *Oil & Col. Tr. J.* (1924), 1165
Remington & Francis, 161
Thorpe, **9**, 640

Standards

- BS 285 : 1952; BS 2876 : 1957 (Ivory black)
USA ASA K36-1; ASTM D210-47; Fed. Spec. TT-B-60
TT-P-330 Bone-black dry
Egypt EOS 1963 467 Black Carbon pigments for paint
Holland NEN 1531:1963 (Pigments: Methods of test for Carbon Black)
India IS 41
Poland PN C81011

Reactions

Becomes white when heated in presence of air

77268 C.I. Pigment Black 8

Impure carbon of organic and mineral origin

Various organic and mineral substances rich in carbon, particularly lignite, ethiops mineral, anthracite, bituminous coal, slate, etc, waste from expressing seeds or fruit, nut shells, hop residues from breweries, paper mill refuse, various kinds of bark or wood, etc, are carbonised or distilled in absence of air. The soft loose carbon formed is washed, dried, ground and sifted. Small quantities of calcium carbonate remaining are not deleterious and are seldom removed

A number of carbonaceous earths are worked, the best known in the U.K. being a seam 2 ft. thick at Bideford, Devon, which yields **Bideford Black**. The best grades contain as much as 74% of carbon

Grade Black or **Coke Black** is a fine product obtained from the coke produced in the Thuringian lignite industry

Charcoal Black, inferior from the pigment point of view, is obtained by charring various non-resinous softwoods

Black Chalk, a brownish to bluish black carbonaceous shale, inferior as a pigment to the carbon blacks

Blue Black obtained from vine twigs or cocoa nut shell, a common black shaded with a blue is often sold under this name

Frankfurt Black is carbonised wine lees

Swedish Black is made from birch bark

Literature

Remington & Francis, 161 (Charcoal Black), 163 (Mineral Black)

Standard

BS 1014:1952 (Carbonaceous black pigments, forcement, etc.)
Egypt EOS 1963 467 Black Carbon pigments for paint

77280

Cerium oxide

Used as **Cerium Yellow** an orange yellow pigment

77288 C.I. Pigment Green 17 (Yellowish green → Green)

Chromic oxide or chromium sesquioxide Cr_2O_3

(1) Reduce potassium dichromate at high temperature

(2) Calcine ammonium or sodium dichromate, chromic chloride or mercurous chromate

(3) Precipitate chrome alum or chromium salts with an alkali, wash and calcine

(4) Calcine, with caustic soda, the chromium hydrate obtained as a byproduct in the oxidation of toluene to benzoic acid—*BIOS* 1402, 137

Leaf Green is a very durable pale green pigment obtained by igniting a mixture of chromic oxide and pure aluminium hydroxide

Chromaventurine a glass coloured by chromium oxide. It is used for painting porcelain and colouring glass — *Bersch*, 266

Literature

BIOS 1402, 137

FIAT 814

Standards

BS 318 : 1952 (Green oxide of chromium for paints) ; BS 2876 : 1957 (Oxide of chromium); BS 318:1968 Chrome oxide pigments. Type 1 for paints. Type 2 for plastics and rubber

BS 1014:1961 (Chromium oxide pigment for cement etc.)
USA ASA K37-1 and K28-1; ASTM D263-46 and D213-47;

Fed. Spec. TT-C-235 (3) and TT-C-306; TT-P-347
Chromium oxide green, dry

Argentine IRAM 1055; IRAM 1961 1183 Green Chromic Oxide for paints

Holland N 1533

India IS 54

S. Africa SABS 65

Sweden SIS 16 04 07

77289 C.I. Pigment Green 18 (Green → Bluish green)

Hydrated chromium sesquioxide $\text{Cr}_2\text{O}(\text{OH})_4$, or mixtures of $\text{Cr}_4\text{O}_3(\text{OH})_8$ and $\text{Cr}_4\text{O}(\text{OH})_{10}$ with Cr_2O_3 and 0.5–10% of boric acid

(1) Ignite potassium or sodium dichromate (1 part) with boric acid crystals (3) at dull red heat in absence of air, extract with water and steam, levigate, dry and grind. Insufficient boric acid results in a browner product

(2) Reduce sodium dichromate with molasses at 350–360°C/300 atms.

(3) Heat chromic hydroxide, $\text{Cr}(\text{OH})_3$, with boric acid or silica gel

Discoverers — Pannetier and Binet ca. 1838

Schultz, Nikolskaya & Penkova, *J. Chem. Ind. Russ.* 6 (1929), 142

Köszegi & Giro, *Chem. Z.* 51 (1927), 303

BIOS 1402, 144

Remington & Francis, 128

Bersch, 264 (Guignet's Green), 264 (Emerald Green), 264 (Chrome Green Lake), 255 (Leaf Green)

Knecht & Fothergill, 706, 840

Standard

BS 1014 : 1942 (Hydroxides of chromium pigment for cement, etc.); BS 2876 : 1957 (Viridian)

USA ASTM D12-47 and D213-47; ASA K58-1, ASTM D126

Argentine IRAM 1961 1183 Hydrated Green Chromic Oxide for paints

Holland NEN 1905 5276 Pigments: Test methods for Chrome Oxide Green

77292

Chromium borate

Used as a pigment in calico printing

77295

Chromic chloride

Form pure chromic oxide into balls with charcoal, starch and water, bring to white heat, pass chlorine through and condense the pure chromic chloride which sublimes off. Heating and passing of chlorine is continued until a sample of the mass no longer gives a green aqueous solution. It is a violet pigment

Discoverer — Wöhler

Literature

Bersch, 276

77298 C.I. Pigment Green 17 (note)

Chromic phosphate $\text{CrPO}_4 \cdot 4\text{H}_2\text{O}$

Arnaudan's Green Heat ammonium phosphate (128 parts) with potassium dichromate (149) to form the metaphosphate

Dingler's Green A mixture of chromic and calcium phosphates

Plessy's Green Treat 10% aqueous potassium dichromate with acid calcium phosphate and cane sugar dissolved in hydrochloric acid

Schnitzer's Green Treat an aqueous solution of 30 parts of potassium dichromate with 72 parts of sodium phosphate and 12 parts of tartaric acid

A violet chromic phosphate, $\text{CrPO}_4 \cdot 6\text{H}_2\text{O}$ is precipitated when cold solutions of chrome alum and disodium hydrogen phosphate are mixed, on boiling it is converted into the green $\text{CrPO}_4 \cdot 4\text{H}_2\text{O}$

Literature

Bersch, 265 (Arnaudan's Green), 266 (Plessy's Green), 266 (Schnitzer's Green)

77302 C.I. Pigment Red 121 (Dull bordeaux)

Chromium stannate

Convert tin (1 kg.) with concentrated nitric acid into metastannic acid. Mix potassium dichromate (50 g.) dissolved in water (1 litre) with chalk (2 kg.) and powdered quartz (1 kg.) and add the mixture to the metastannic acid. Dry, raise to white heat until sintered, extract with boiling water and dry the resulting fine powder which is used as a red pigment

Tin Violet or **Mineral Lake** Fuse stannic oxide (100 parts) with chromium oxide (2 parts). A very permanent pigment

Standard

Holland N1941

77305

Chromic sulfate $\text{Cr}_2(\text{SO}_4)_3$

Occurs in three forms (a) no water of crystallisation, violet or red, (b) 15 mol. water of crystallisation, dark green, (c) 18 mol. of water of crystallisation

Treat chromium hydroxide with sulfuric acid and crystallise

Used in green paints, varnishes and inks and as a green colouriser in ceramic glazes

Solubility

(a) is insoluble in water, (b) and (c) are soluble in water

77310 C.I. Pigment Brown 24 (Yellowish brown)

Cr-Sb-Ti oxide mixed phase system having a rutile structure

77320

Metallic cobalt

(1) Reduce cobalt oxide with hydrogen in an electric muffle furnace

(2) Reduce a cobalt salt *in situ* with pyrogallol — Redgrove & Bari-Woolls, *Hair Dyes and Hair Dyeing*, London (1939)

77322 C.I. Pigment Black 13 (Grey black)

Cobaltous oxide CoO

Produced either as grey or black oxide (the grey being of average finer particle size) from the converter slag produced in copper refining in N. Rhodesia. The slag is digested with hot sulfuric acid, filtered and the filtrate oxidised with sodium chlorate and sulfuric acid, chalk slurry added, filtered, soda ash added to the clear cobalt sulfate liquor and the basic carbonate filtered off, calcined and lixiviated

Zaffre is a crude cobalt oxide made by roasting smaltite, cobaltite or cobalt-nickel pyrites. It is used as a blue pigment

Literature

Bryant, *Chem. Tr. J.* 125 (1949), 181

Ando & Umemoto, *Bull. Osaka Ind. Research Inst.* 2 (1951), 89

77323

Cobaltic oxide or cobalt peroxide Co_2O_3

Precipitate a cobaltic salt with caustic soda and heat the resulting cobaltic hydroxide to produce a steel grey to black pigment

The oxide, Co_3O_4 is also used as a pigment

Literature

Ando & Umemoto, *Bull. Osaka Ind. Research Inst.* 2 (1951), 89

77326

Literature

Bersch, 281

Cobalt Brown is obtained by calcining a mixture of ammonium, ferrous and cobalt sulfates

77330

A complex cobalt oxide-magnesium oxide compound

Mix magnesium carbonate into a thin paste with dilute aqueous cobalt nitrate, heat and stir till dry and then fuse in a covered crucible. It is used as a pink pigment

Literature

Hedvall, *Z. anorg. Chem.* **86** (1914), 296
 Bersch, 188 (Cobalt-Magnesia Red)

77335 C.I. Pigment Green 19

An isomorphous mixture of cobalt zincate, $\text{CoO} \cdot \text{ZnO}$, and zinc oxide which cannot be chemically separated

(1) **Rinmann's Green** Precipitate zinc sulfate (16 parts) and cobalt sulfate (7) with potassium or sodium carbonate, dry and ignite at very high temperature until the colour intensity no longer increases

(2) Precipitate cobalt chloride (1) and zinc chloride (5) with soda ash, wash, dry and ignite

(3) Heat zinc oxide (9) and cobaltous oxide (1) in a muffle furnace or for a darker green zinc oxide (1) and cobalt phosphate (5)

(4) Calcine zinc oxide (100) and cobaltous nitrate (2.5) to obtain particularly a bright product, the brightness of hue being increased if phosphoric or arsenic oxide is present in the mix

(5) **Gellert Green** Ignite cobalt (1) with sodium nitrate (4-5) and zinc oxide (8-10)

Literature

McEachern, *Mining World*, **34** (1911), 71
J. Oil Col. Chem. Assocn. **9** (1926), 307
 Natta & Passerini, *Gazz.* **59** (1929), 620
 Hedvall & Nilsson, *Z. anorg. Chem.* **205** (1932), 425
 Ando, Minami & Tsubota, *Bull. Osaka Ind. Research Inst.* **2** (1951), 7
 Ando & Umemoto, *ibid.* 89
 Korinth, *Angew. Chem.* **64** (1952), 265

Standard

BS 2876 : 1957

77339

Cobalt zinc phosphate, the proportions of cobalt and zinc vary

Precipitate zinc sulfate with sodium phosphate, add cobalt sulfate and precipitate that with more sodium phosphate, dry and ignite the combined precipitate. The product is a blue pigment

77343 C.I. Pigment Green 26 (Dull bluish green)**C.I. Pigment Blue 36**

(Bright reddish blue → Bright greenish blue)

Chromic oxide-alumina-cobaltous oxide

Turkish Green

Ignite a dry mixture of aluminium hydroxide (60 parts), chromium oxide (30) and cobalt carbonate (30) at white heat, grind and levigate. Hue unaffected in artificial light

Literature

Bersch, 265

77346 C.I. Pigment Blue 28 (Blue)**C.I. Pigment Green 14 (component)**

Cobaltous aluminate of varying composition $\text{CoO} \cdot \text{Al}_2\text{O}_3$ being blue and $4\text{CoO} \cdot 3\text{Al}_2\text{O}_3$ green

(1) **Thénard's Blue** Precipitate aqueous cobalt nitrate (free from iron and nickel) with sodium phosphate, well wash the violet precipitate of cobalt phosphate and mix with freshly precipitated alumina. Dry the mixture and calcine until the requisite blue obtained. The reddish blue product is ground with water and dried. The hue is improved by addition of sodium phosphate or ammonium-magnesium phosphate — cf. McEachern, *Mining World*, **34** (1911), 71. Greener hues are obtained by adding zinc oxide

(2) **Leithner Blue** is obtained similarly by using cobalt arsenate and alumina

(3) Fuse alumina, zinc oxide and Co_3O_4 at 1300°C

(4) Precipitate a cobalt salt with alum and sodium carbonate or phosphate and calcine

(5) Fuse aluminium sulfate, cobalt sulfate and ammonium alum at $1350\text{--}1700^\circ\text{C}$, wet grind, neutralise with ammonia if free sulfuric acid present, dry and grind

Literature

Vanino, *Chem. Z.* **35** (1911), 497
 Hedvall, *Arkiv.Kemi, Min., Geol.* **5** (16) (1914), 1
 Gant, *Chem. & Ind.* **44** (1925), 160
J. Oil Col. Chem. Assocn. **9** (1926), 304
 Nalte & Passerini, *Gazz.* **59** (1929), 620
 Remington & Francis, 151

Standard

BS 2876 : 1957 (Cobalt blue defined as cobalt aluminate or phosphate containing some alumina)

At one time also known as

Kings Blue

Leyden Blue

77350

Cobaltous arsenate $\text{Co}_3(\text{AsO}_4)_2 \cdot 8\text{H}_2\text{O}$

Occurs naturally as the mineral *erythrite*

Manufactured by precipitating a cobalt salt with sodium arsenate

Used for painting light blues on glass and porcelain and for colouring glass. Used as a pigment in paints under the name of **Cobalt Violet** (which name however, is also used for cobalt phosphate, C.I.77360) it is absolutely permanent and transparent but has little tinting power but finds some use as an artists' oil and water colour pigment

Literature

Ando & Minami, *Bull. Osaka Ind. Research Inst.* **3** (1952), 44

Standard

BS 2876 : 1957 (Cobalt violet defined as cobalt phosphate or arsenate or a mixture of both)

77353Cobaltous carbonate CoCO_3 A pink insoluble powder used as a pigment

77357 C.I. Pigment Yellow 40 (Yellow)Potassium cobaltinitrite $2\text{K}_3(\text{Co}(\text{NO}_2)_6) \cdot 3\text{H}_2\text{O}$

Precipitate cobaltous nitrate, acidified with acetic acid, with potassium nitrite

Reactions

Decomposed by mineral acid and on heating. Decomposed by sodium hydroxide with formation of the brown oxide

Discoverer — Fischer 1848*Literature**Bersch*, 156*Standard*

BS 2876 : 1957

*Solubility*Slightly soluble in water

77360 C.I. Pigment Violet 14Cobalt phosphate $\text{Co}_3(\text{PO}_4)_2 \cdot 8\text{H}_2\text{O}$ — pink, $\text{Co}_3(\text{PO}_4)_2 \cdot 4\text{H}_2\text{O}$ — deep violet, $\text{Co}_3(\text{PO}_4)_2$ — violet

Precipitate a cobalt salt with sodium phosphate. On drying at normal temperature the product is pink (Cobalt Red). By careful heating the hue becomes more violet according to the temperature used

*Literature*Ando, Minami & Tsubota, *Bull. Osaka Ind. Research Inst.* 1 (1950), 63*Remington & Francis*, 152*Standard*

BS 2876 : 1957 (Cobalt violet defined as cobalt phosphate or arsenate or a mixture of both)

77362 C.I. Pigment Violet 14 (related)Cobalt ammonium phosphate $\text{CoNH}_4\text{PO}_4 \cdot \text{H}_2\text{O}$ *Solubility*Insoluble in water; soluble in acids

77365 C.I. Pigment Blue 32Potassium cobaltous silicate of varying composition,
 $\text{CoO} \cdot 2\text{SiO}_2 \cdot \text{K}_2\text{O} \cdot 2\text{SiO}_2$

being probably the fixed basic compound

Powdered cobalt ores, smaltite in Saxony or cobaltite in Norway and Sweden, are washed, roasted to expel sulfur and arsenic until only sufficient arsenic remains to combine with the less oxidisable metals, particularly copper and nickel, and the greater part of the cobalt is converted into oxide. This is then fused with pure potassium carbonate and powdered quartz. Impurities sink and the **Smalt** is ladled into cold water, powdered and levigated. Levigation must be done with care because water renders Smalt sandy and the hue becomes lighter and less pleasing because of some dissociation. It is a true glass, the X-ray spectra showing no trace of a diffraction pattern**King's Blue** is richest in cobalt and **Azure Blue** the darkest product. Some products may contain cobalt aluminate or zincate*Discoverer* — Unknown, but the word Smalt was used as early as 1492 and a glass pigment of that name described in 1584. In the seventeenth century it was in general use as an artists pigment*Literature**Bersch*, 233

77368 C.I. Pigment Blue 35 (Blue)Cobaltous stannate $\text{CoO} \cdot \text{SnO}_2$ but the commercial product usually approximates to 18% CoO , 50% SnO_2 and 32% CaSO_4

Calcine cobalt sulfate (120 parts), stannous chloride (100) and chalk (100), wet grind and dry

The sky blue product retains its hue in artificial light

A complex cobalt magnesium stannate is used as a blue ceramic pigment

*Literature**Bersch*, 231*Standard*

BS 2876 : 1957 (Cerulean blue defined as cobalt stannate containing silica)

*Reactions*Nitric acid dissolves the cobalt leaving a white residue

77372Cobaltous sulfide CoS Cobaltic sulfide Co_2S_3 Cobalt polysulfide Co_2S_7 Used as a black hair dye by being formed *in situ* by the double decomposition of cobalt nitrate and an alkaline sulfide*Literature*Redgrove & Bari-Woolls, *Hair Dyes and Hair Dyeing*, London (1939)**77376**Cobaltous tungstate CoWO_4

Precipitate a cobalt salt with sodium tungstate

Used as a reddish orange pigment

77400 C.I. Pigment Metal 2

Metallic copper

(1) Precipitate copper sulfate with metallic zinc

(2) Stamp copper with calcium metal and heat for > 24 hr. at 40–50°C

Bronze Powder often consists of alloys of 80–99.9% of copper with zinc and/or iron*Literature*Wendon, *JSDC*, 71 (1955), 125*Standards*USA ASTM D964–48T; ASTM D267–41 (**Gold Bronze**)
Argentine IRAM 1108

77402Cuprous oxide Cu_2O

Occurs naturally as cuprite or red copper ore

The synthetic product is made in various ways, e.g.

- (1) Heat cuprous chloride with soda ash in absence of air
- (2) Heat cupric oxide in sulfur dioxide

When used in ceramic glazes yields green, blue-green or red depending upon the composition of the glaze. The pigment used for ruby glass

Literature

Hammick, *JCS*, **111** (1917), 384
Abel & Redlich, *Z. Elektrochem.* **34** (1928), 323

Standards

USA ASTM D912-47T
India IS 70

77403 C.I. Pigment Black 15Cupric oxide CuO

Occurs naturally as *tenorite* or *melaconite* especially at Lake Superior

Manufactured by heating cupric nitrate or carbonate to dull redness

Used as a black pigment and in making blue or green glass, porcelain, etc.

Copper Brown Mix aqueous copper sulfate (2 parts) and magnesium sulfate (1 part) and add potassium carbonate so long as a precipitate forms, filter, dry and ignite

Chrome Brown Mix aqueous potassium chromate and a copper salt and dry the precipitate when a product of constitution $\text{CuCrO}_4 \cdot 2\text{CuO} \cdot 2\text{H}_2\text{O}$ is obtained

Literature

Bersch, 280

77404Cupric hydroxide $\text{Cu}(\text{OH})_2$

A blue pigment obtained in the following ways —

(1) Add aqueous 10% sodium hydroxide to iron-free aqueous copper sulfate at 15–20°C until no more precipitate is formed, allow to settle, decant the liquor, add aqueous sodium hydroxide, sp. gr. 1.24–1.26 until no increase in blue colour. Pour the mixture into cold water and dry the precipitate first at 35°C and then at 55°C

(2) Mix copper foil with an aqueous paste of copper sulfate and brine. Give prolonged oxidation in thin layers until copper oxychloride is formed, convert this to the basic chloride with hydrochloric acid and treat with caustic soda to form the hydroxide

(3) Dissolve copper sulfate in soft water and precipitate with caustic soda. Wash and treat with caustic soda or soda ash for dark and light grades respectively

(4) Dissolve copper oxide in nitric acid to a neutral solution then autoclave with calcium carbonate at 25–36°C/5–6 atm., wash and dry below 60°C

(5) Precipitate a mixed solution of copper sulfate and ammonium chloride with milk of lime. The product contains varying proportions of calcium sulfate

Literature

BIOS 1402, 149

Bersch, 226 (Bremen Blue, Bremen Green)

Standard

Holland N886 (Methods of test for Bremen green)

Reactions

Decomposes when heated

Neuberg Blue A mixture of copper hydroxide and Chinese Blue, C.I. 77510

Lime Blue A mixture of copper hydroxide and gypsum

Payen's Mountain Blue A mixture of copper hydroxide and calcium carbonate

77408 C.I. Pigment Green 20

Basic copper acetate — $\text{Cu}(\text{OOC} \cdot \text{CH}_3)_2 \cdot \text{Cu}(\text{OH})_2 \cdot 5\text{H}_2\text{O}$ — **Blue Verdigris**, $2\text{Cu}(\text{OOC} \cdot \text{CH}_3)_2 \cdot \text{Cu}(\text{OH})_2 \cdot 5\text{H}_2\text{O}$ together with a little $\text{Cu}(\text{OOC} \cdot \text{CH}_3)_2 \cdot 2\text{Cu}(\text{OH})_2 \cdot \text{H}_2\text{O}$ — **Green Verdigris** and $\text{Cu}(\text{OOC} \cdot \text{CH}_3)_2 \cdot \text{H}_2\text{O}$ — **Neutral Verdigris**

The commercial products contain varying proportions of these compounds, their hue varying from bluish green to deep emerald green

(1) **French Process** Rub sheet copper with **Verdigris** and place in earthen pots filled with the marc of grapes (skins, etc. left after the juice has been expressed), put in superimposed rows in chambers kept at constant temperature. The acetic acid formed by the marc fermenting gradually converts the copper into basic acetate

(2) **German Process** Place copper plates, 3 mm. thick, between flannel soaked in acetic acid, the flannel being renewed every 2–6 days for about 8 weeks

Neutral Verdigris (1) Dissolve copper turnings in acetic acid, concentrate the solution and crystallise

(2) Add finely ground copper sulfate to molten lead acetate, stir, allow to set to a solid mass which is then ground

Literature

Remington & Francis, 125

Bersch, 253 (Blue or French Verdigris), 255 (Distilled or Crystallised Verdigris), 258 (German Verdigris), 258 (Swedish Verdigris)

Solubility

Soluble in water, ammonia and mineral acids

Reactions

Decomposed by heat

77410 C.I. Pigment Green 21 (*Bright green*)

Cupric aceto-arsenite $\text{Cu}(\text{OOCCH}_3)_2 \cdot 3\text{CuO}(\text{AsO}_2)_2$

The proportions of the two components varies in commercial products

(1) Boil aqueous Verdigris, C.I. 77408, and precipitate with hot aqueous arsenious oxide

(2) Dissolve arsenious oxide (78 kg.) and soda (40 kg.) in water (50 litres) at 70–80°C and precipitate with a boiling solution of copper sulfate (93.5 kg.) in water (250 litres). Treat the precipitate with acetic acid, sp. gr. 1.043 (91.5 kg.), water (183 litres) at 10–12°C and sufficient hot water to raise to 20–22°C, until the green crystalline product remains unaltered. It is then repeatedly washed and finally dried. The clear and brilliant green hue remains unaltered in artificial light

Discoverers — Russ and Sattler at Schweinfurt in 1814

Literature

Thürmer, *Farben. Z.* **1** (1930), 114

Remington & Francis, 124

Bersch, 244 (Emerald Green), 248 (Mitis or Vienna Green)

Standard

BS 2876 : 1957 (Emerald Green)

Reactions

Dissolves in hot alkalis with separation of red cuprous oxide.

On prolonged boiling in water becomes browner with liberation of acetic acid. Forms cacodyl when heated in a glass tube

77412 C.I. Pigment Green 22

Copper arsenite $3\text{CuAs}_2\text{O}_3 \cdot x\text{H}_2\text{O}$

The composition of the commercial products varies, the more alkali used in the manufacture the more copper oxide in the product

Scheele's Green Precipitate a hot solution (500 litres) of copper sulfate (75 kg.) with arsenious oxide (5–15) and sodium carbonate (17), then add sodium hydroxide until all the copper is precipitated. The greater the amount of arsenic in the product the yellower it is, the bluer varieties contain basic copper carbonate

Brunswick Green or **Green Verditer** Precipitate copper sulfate, tartaric acid and sodium arsenite with milk of lime

Literature

Parnell, *Dyeing & Calico-Printing* (London 1849), 176 (Scheele's Green on textiles)

Bornemann, *Z. anorg. Chem.* **124** (1922), 36

Standard

India IS 53

Lime or Patent Green A mixture of copper arsenite and calcium sulfate — *Bersch*, 250

77415

Copper borate $\text{Cu}(\text{BO}_2)_2$

Add borax (3 parts) to aqueous copper sulfate (2), dry at moderate temperature, heat to red heat according to the hue required in the product, and levigate. The product is a green pigment

Reactions

Soluble in water

77420 C.I. Pigment Blue 30

Basic copper carbonates $\text{CuCO}_3 \cdot \text{Cu}(\text{OH})_2$ — Malachite,
 $2\text{CuCO}_3 \cdot \text{Cu}(\text{OH})_2$ — Azurite

Malachite is a green pigment which occurs naturally in several parts of the world. It can be made by precipitating copper sulfate with soda

Azurite, Pigment Blue 30, occurs naturally as monoclinic tablets or short prisms and as an amorphous or earthy mass at many places in Europe and the U.S.A. The ground mineral, purified by levigating, is a sky blue pigment. The synthetic product obtained by exposing cupric carbonate to air when it soon forms the basic carbonate is, however, green

Blue or Green Verditer or **Blue Bice**, C.I. Pigment Blue 30, now of historic interest only, was a highly basic copper carbonate produced by (1) precipitating copper chloride with lime and after washing the precipitate, digesting it with potassium carbonate and lime, or (2) precipitating copper sulfate with calcium chloride and treating with lime

Discoverer — Malachite is one of the oldest pigments known, being used by prehistoric man

Literature

Weiner, *Ber.* **40** (1907), 4441

Standard

Yugoslavia H B5 015 (Basic cupric carbonate)

Brunswick Green Green basic copper carbonate has been known by this name

77422

Copper bicarbonate

Used as **Verte antique** in paints to produce a corroded copper effect

77426

Basic copper chloride — $\text{CuCl}_2 \cdot 3\text{Cu}(\text{OH})_2 \cdot \text{H}_2\text{O}$

A green pigment

(1) Expose a moist mixture of copper sulfate (111), copper (112.5) and sodium chloride (112.5) to air — *Bersch*, 243

(2) Moisten copper turnings with aqueous sal ammoniac and expose them to air, wash the oxychloride formed off with water and dry it at gentle heat

Standard

Yugoslavia H B5 016 (Basic cupric oxychloride)

Kuhlmann's Green Heat lime with excess copper chloride — *Bersch*, 248

77429 C.I. Pigment Black 23

$\text{CuO} \cdot \text{Cr}_2\text{O}_3 \cdot \text{Fe}_2\text{O}_3$ in spinel-type crystalline form

77430 C.I. Pigment Brown 9

Cupric ferrocyanide $\text{Cu}_2\text{Fe}(\text{CN})_6 \cdot \text{XH}_2\text{O}$
Cupric potassium ferrocyanide $\text{CuK}_2\text{Fe}(\text{CN})_6$

(1) Add aqueous potassium ferrocyanide to aqueous copper sulfate (free from lime), wash the precipitate and dry

(2) Add aqueous copper sulfate to aqueous potassium ferrocyanide to which ammonia has been added several hours previously, wash the precipitate and dry

Literature

Parnell, *Dyeing & Calico-Printing* (London 1849), 39 (Prussiate of copper on textiles)
Bersch, 280 (Hatchett Brown)

Reactions

Decomposed by alkalis and mineral acids

77432

Cupric potassium ferrocyanide $\text{K}_2\text{CuFe}(\text{CN})_6 \cdot \text{H}_2\text{O}$

Copper or Goyard's Violet Precipitate copper ammonium sulfate with potassium ferrocyanide, dry and heat at 170°C when ammonia and cyanogen are liberated, oxygen is absorbed and the mass becomes violet. Heating at 200°C yields a blue product which at $240\text{--}250^\circ\text{C}$ becomes greenish. It is a violet pigment having a great covering power

A clean bright maroon pigment of approximate constitution $\text{CuK}_2\text{Fe}(\text{CN})_6$ is obtained by treating 20–30% aqueous copper sulfate at $75\text{--}100^\circ\text{C}$ with 20–30% aqueous potassium ferrocyanide while maintaining excess ferrocyanide in the mixture — IC USP 2564756

Discoverers (of the maroon pigment) — Gessler and Goeffert

77437 C.I. Pigment Blue 31

Copper silicate
Calcium copper silicate $\text{CaO} \cdot \text{CuO} \cdot 4\text{SiO}_2$

(1) Add water glass to aqueous copper sulfate and dry the precipitate to obtain a pale green pigment

(2) Fuse a mixture of quartz, chalk, copper oxide and soda (all free from iron), the product is blue the exact hue varying with the proportions of copper oxide and chalk used

Discoverer — The oldest synthetic pigment, being used in Egyptian mural paintings of ca. 1000 B.C.

Literature

Davy, *Phil. Trans.* (1815)
Fouqué, *Compt. rend.* **108** (1889), 325
Laurie, McLintock & Miles, *Proc. Roy. Soc.* **A89** (1914), 418
Bock, *Z. angew. Chem.* **29** (1916), 228
Lucas, *Analyst*, **51** (1926), 435
Partington, *Development of Applied Chemistry*, London (1935), 117

77439

Cupric silicofluoride $\text{CuF}_2 \cdot \text{SiF}_4 \cdot 4\text{H}_2\text{O}$

Treat copper hydroxide with hydro fluosilicic acid
Used for dyeing and hardening white marble

Solubility

Soluble in water

77441

Cupric stannate

Gentile's Green

Precipitate a solution of stannic chloride and copper sulfate with caustic soda and ignite the precipitate

77445

Basic copper sulfate $\text{CuSO}_4 \cdot 3\text{Cu}(\text{OH})_2 \cdot \frac{1}{2}\text{H}_2\text{O}$

The commercial product, **Casselmann's Green**, contains some arsenious oxide

Mix boiling solutions containing copper sulfate (4 equivalents) and sodium acetate (3)

Occurs as an impurity in some commercial varieties of cupric hydroxide, C.I.77404, prepared by precipitating copper sulfate with sodium hydroxide

77449

Cuprous sulfide Cu_2S

Used as a black pigment (particularly suitable for use in antifouling paints)

Literature

BP 708147

77450 C.I. Pigment Blue 34

Cupric sulfide CuS

Occurs naturally in the massive state or in hexagonal crystals as covellite or indigo copper at Mansfield, in Chile, etc.

The synthetic product is prepared in various ways, e.g.

(1) Add copper (free from oxide) to molten sulfur until the latter almost disappears. Boil the product with sodium hydroxide, wash, dry and powder. Repeat the treatment with sulfur if a blue of correct hue has not been obtained

(2) Add sodium sulfide to aqueous copper sulfate and convert the precipitate into a paste

Used as a brownish black hair dye by treating the hair first with a copper salt and then with a compound yielding sulfur

77480 C.I. Pigment Metal 3

Metallic gold

Many commercial products are mixtures of metallic gold and tin oxide or sometimes with other oxides or substitutes

Gold Powder Precipitate the oxide and mix with a soft flux, which in the kiln causes reduction to the metal, for application to ceramics. Brightness is enhanced if a slight addition of rhodium is made

Shell Gold Rub goldbeater's waste down with gum and dry. Used as a metallic decoration or in colloidal form to colour glass and ceramic glazes reds and purples. Also precipitated on bases such as magnesia or alumina to give red, pink or purple pigments

Burnish Gold Liquids containing gold or organic compounds of gold with or without platinum or silver added to lighten or to shade the product on the greenish side

Literature

Andreas Cassius, *De Auro* (1685)
Müller, *J. pr. Chem.* **30** (1884), 252
Rose, *Chemical News*, **66** (1892), 271
Schneider, *J. anorg. Chem.* **5** (1894), 80
Antony & Lucchesi, *Gazz.* **26** (ii) (1896), 195
Zsigmondy, *Ann.* **301** (1898), 361
Moissan, *Compt. rend.* **141** (1905), 977
Miller, *Ceramic Industry* (Oct. 1954), 92
Bersch, 192 (Magnesium Gold Purple), 193 (Aluminium Gold Purple), 326 (Shell Gold)

77482 C.I. Pigment Red 109

Aurous stannate

Composition of commercial products varies and in some cases may be a complex mixture of gold and stannic acid

(1) Mix a solution of stannous and stannic chlorides with a very dilute solution of gold chloride and ignite the precipitate

(2) Add tin chloride to a solution of ferric chloride until it turns green, then add it gradually to a solution of gold chloride

The product is purple, the exact hue depending upon the molecular state

Discoverer — Andreas Cassius before 1685

Andreas Cassius, *De Auro* (1685)
Haber, *Physikal Z.* **25** (1924), 45
Thorpe, **6**, 122
Bersch, 190

77485

18–8 Stainless steel, i.e. 74% iron+18% chromium+8% nickel

The metal is milled until a silver grey powder having a bluish cast is obtained

Literature

Greenwood, *Paint*, **19** (1949), 302

77489

Ferrous oxide FeO

Heat ferrous oxalate in absence of air

Used to colour glass green

Literature

Zsigmondy, *Dingler's Polytech. J.* **287** (1893), 17

77491 C.I. Pigment Red 101 and 102
C.I. Pigment Brown 6 and 7

Ferric oxide Fe_2O_3

Occurs in nature as iron ore, red haematites and as a constituent of many minerals and rocks which are brownish red because of its presence. It is the main constituent of **Red Ochre** or **Raddle** obtained by calcining Ochres and Siennas. **Micaceous Iron Ore** or **Specular Iron** is a form of haematite, Fe_2O_3 , and is a black leafing pigment which becomes red on grinding because the crystal structure is destroyed

There are numerous ways of producing synthetic ferric oxide, e.g.

(1) Calcine the yellow and black iron oxides from the aniline manufacture or from ferrous chloride

(2) Oxidise iron pentacarbonyl

(3) **Vogel's Iron Red** calcine ferrous oxalate at 200°C

(4) Calcine ferrous sulfate

(5) Purple oxides are obtained from burning pyrites in the manufacture of sulfuric acid

(6) **Burntisland Red** dissolve the aluminium from bauxite with caustic soda, the "red mud" left contains on the average 40% Fe_2O_3

(7) **Prussian Brown** obtained by calcining Prussian Blue, C.I. 77510 at 250°C , is mainly Fe_2O_3

(8) **Bauxite Residue** is a yellowish red pigment obtained from the iron oxide left after the aluminium has been extracted from bauxite

(9) **Iron Brown** Ignite natural yellow ochre (100 parts) with sodium chloride (5 parts)

Yellow Oxide of Iron

Sweden SIS 16 04 08

Black Oxide of Iron

Sweden SIS 16 04 09

Venetian Red

BS 370 : 1952; BS 2876 : 1957 (Venetian red defined as chemically prepared ferric oxide with a proportion of calcium sulfate)

USA Fed. Spec. TT-Y-226 (1)

Blended Red Oxides of Iron

BS 694 : 1936

Red and Yellow Oxide of Iron Pigment for Cement

BS 1014 : 1961

Iron Oxide Pigments

BS 3981 Iron oxide pigments for paints

USA ASA K 25

Argentine IRAM 1015 Argentine IRAM 1957 1151 Coloured artificial iron oxide for paints

Egypt EOS 1963 398 Standard methods of physical and chemical tests for iron oxides for paints

France T31-002

Holland N882 and N883

Israel SII 334 Pigments for paints, manufactured iron oxide

Literature

Wöhler & Condrea, *Z. angew. Chem.* **21** (1908), 481

Storey, *J. Oil Col. Chem. Ass.* **15** (1932), 33 (natural iron oxide)

Smith, *ibid.* **20** (1937), 307

Doobey, *ibid.* **25** (1942), 74

Francile, *Rev. Facultad. Cienc. quim. (Univ. nacl. La Plata)*, **22** (1947), 301

Schumpelt, *Farben, Lacke, Anstrichstoffe*, **3** (1949), 46

DeWitt, Livingood & Miller, *Ind. Eng. Chem.* **44** (1952), 673

Cawterman, *Canadian Chem. Processing*, **38** (1) (1954), 50

Remington & Francis, 131 (natural iron oxides), 137 (synthetic iron oxides), 141, 142

Uspenskaya et al, *J. Appl. Chem. U.S.S.R.* **29** (1956), 1040, 1142, 1601

BIOS 1272

Standards

Natural Iron Oxides

BS 272 : 1952; BS 2876 : 1957 (Indian red)

USA Fed. Spec. TT-M-381; TT-M-251

Australia K 59

Egypt EOS 1963 387 Natural Oxides of Iron for paints

Germany DIN 55913

India IS 1960 1684 Natural red oxides of iron for the rubber industry

USA TT-P-408 Pigment, mineral red (iron oxide) natural, dry

TT-P-457 Pigment, venetian red, dry

India IS 46

Ochre

BS 337 : 1952; BS 2876 : 1957 (Light red)

USA ASTM D85-47

Australia K 65

France T 31-002 (Pigments: ochres)

India IS 47

Poland PN C608

Sienna

BS 312 : 1952; BS 2876 : 1957 (Burnt sienna)

USA Fed. Spec. TT-S-346 (1); ASTM D765-48

Australia K 63

India IS 48

Burnt Umber

BS 313 : 1952; BS 2876 : 1957

USA Fed. Spec. USA TT-P-455 Umber, raw and burnt, dry

TT-U-481 (1); ASTM D763-48

Australia K 64

India IS 49

Poland PN C623

Manufactured Iron Oxides

BS 305 and 851 : 1952; BS 2876 : 1957 (Indian red (synthetic),

Mars red)

Australia K 60

India IS 45

Purple Oxide of Iron

BS 339 : 1952

Red Oxide of Iron

BS 370 : 1952

USA Fed. Spec. TT-I-511a (1)

Holland NEN 1962:882 (Method of test for Red Iron Oxide)

Sweden SIS 16 04 06

Poland PN C81020

S. Africa SABS 293

77492 C.I. Pigment Yellow 42 and 43
C.I. Pigment Brown 6 and 7

Hydrated ferric oxide $\text{FeO}(\text{OH}) \cdot n\text{H}_2\text{O}$, n varying from 0 upwards

Occurs as goethite, $\text{FeO}(\text{OH})$, the main constituent of the various yellow ochres and siennas found widely distributed in nature. Also as the main constituent of the various umbers which also contain considerable amounts of manganese dioxide and mangano-manganic oxide with some alumina and of brown haematite

Synthetic products are made in many ways, e.g.

(1) Oxidise ferrous salt solutions in presence of scrap iron. The particle size and shape which determine the hue, pale yellow-orange-brown, are controlled by rate and time of oxidation and the concentration and pH of solutions

(2) By product in making aniline by reducing nitrobenzene with scrap iron

(3) Precipitate ferrous sulfate or chloride with alkali and oxidise in a current of air at 30°C for 8–16 hr.—Penniman & Zolph, *USP* 1327061 and 1368748

Ferrite Yellow $\text{FeO}(\text{OH})$ consists of rhombic crystals and has good hiding power

Mars Yellow $\text{FeO}(\text{OH}) \cdot x\text{H}_2\text{O}$ is amorphous. It has higher tinting strength and oil absorption than Ferrite Yellow but tends to chalk and thicken

Chamois, Iron Buff, Nankin Yellow and Vouille are obtained by impregnating cotton with aqueous ferrous sulfate, passing through milk of lime and washing in running water

Khaki is produced by padding cotton with aqueous ferrous and chromic acetates, drying, steaming and then passing through a 1:3 mixture of aqueous caustic soda and soda ash at the boil

Manufactured Hydrated Oxides of Iron

BS 851 : 1952; BS 2876 : 1957 (Mars yellow, Mars orange)
USA Fed. Spec. TT-P-216b; ASTM D768-47 (*Yellow Iron Oxide, Hydrated*)

Argentina IRAM 1957 1151 Coloured artificial iron oxide for paints

Israel SII 334 Pigments for paints, manufactured iron oxide
Holland NEN 5266:1964 (Pigments: methods of test for Yellow Iron Oxide, Hydrated)

Yellow Hydroxide of Iron Pigment for Cement

BS 1014:91 Ironhydroxide (including natural ochres)
USA Fed. Spec. TT-Y-216 (2)

Discoverer — One of the oldest pigments known

Literature

Theis, *Khaki on Cotton and other textile materials*, London (1903)
Ladoo, *Non-metallic minerals*, New York (1928), 368

Wilson, *Industrial Minerals and Rocks*, New York (1937), Chapter XXVIII

Johnstone, *J. Oil Col. Chem. Assocn.* **24** (1941), 263

Pocock, *Natural Earth Pigments of England and Wales: Geol. Survey. Gt. Britain* 1942, *Wartime Pamphlet* No. 21, London, HMSO (1942)

BIOS 1272

Voigt, *Farben, Lacke, Anstrichstoffe*, **2** (1948), 70

Bhende & Ramachandran, *J. Sci. Ind. Research (India)*, **7B** (1948), 176; **8B**(1) (1949), 10 — *Khaki*

Boido & Jacquet, *Peintures, Pigments, Vernis*, **24** (1948), 342

Charin, *Ind. céram.* (Ed. B. Rev. *Matériaux construction*) No. **386** (1948), 108

Darulla & Nabar, *J.S.D.C.* **68** (1952), 168; *Kolloid Z.* **127** (1952), 33 — *Khaki*

Shmatkova, *Zhur. Priklady Khim.* **28** (1955), 687

Bersch, 155 (Mars Yellow, Orange and Red)

Knecht & Fothergill, 704, 839

Kröner, *Compt. rend. 27^e Congr. intern. Chim. ind. (Brussels)*, **2** (1954): *Industrie Chim. belge*, **20** (Spec. No.) (1955), 595 (Manufacture of Pigmentary Oxides and Hydrous Oxides of Iron)

Standards

Natural Iron Oxide

Egypt EOS 1963 387 Natural Oxides of Iron for paints, EOS 1963 398 Standard methods of physical and chemical tests for iron oxides for paints

Germany DIN 77492

Yellow Ochres

BS 337 : 1952; BS 2876 : 1957 (Golden ochre, Yellow ochre, Yellow ochre (synthetic))

USA Fed. Spec. TT-O-121 and TT-O-1216; ASTM D85-47
France T 31-002

Holland NEN 1962:883 (Methods of test for Ochre)

Indian IS 47

Raw Sienna

BS 312 : 1952; BS 2876 : 1957

USA ASTM D765-48; Fed. Spec. TT-P-455 Umber, raw and burnt, dry

Holland NEN 1962:883 (Methods of test for Sienna)

Natural Umber

BS 312 : 1952; BS 2876 : 1957; 1014:1961 Brown Iron-manganese oxide (including sienna and umber) for cement

USA ASTM D763-48

Holland NEN 1962: 883 (Methods of test for Umber)

Indian IS 49

77495 C.I. Pigment Brown 11 (Reddish brown)

Magnesium ferrite 79% Fe_2O_3 19%MgO

Heat a stoichiometric mixture of ferric and magnesium oxides at 1000°C

77496 C.I. Pigment Yellow 119 (Yellow)

ZnFe_2O_4

Zinc Iron Yellow: pigment consisting essentially of iron zinc oxide approximating to the above formula

Solubility—Insoluble in water, acids, ammonia and caustic soda

77499 C.I. Pigment Black 11
C.I. Pigment Brown 6 and 7

Ferroso-ferric oxide $\text{FeO} \cdot \text{Fe}_2\text{O}_3$

Ferroso-ferric hydroxide $\text{Fe}(\text{OH})_2 \cdot \text{Fe}_2\text{O}_3$

Occurs widely in nature as magnetite, the magnetic oxide of iron

The synthetic product is produced in many ways, e.g.

- (1) As a byproduct in the reduction of nitrobenzene to aniline when excess iron is used
- (2) Controlled oxidation of precipitated ferrous hydroxide, followed by washing, drying, calcining and grinding
- (3) Oxidise boiling ferrous salt solutions in presence of scrap iron
- (4) Heat freshly precipitated ferrous hydroxide at 190°C under pressure in presence of steam
- (5) Ignite natural yellow ochre (100) with sodium chloride (5)
- (6) Precipitate mixtures of ferrous and ferric salts with caustic soda
- (7) Precipitate ferrous chloride with lime

Literature

Raikon, *Z. angew. Chem.* **1** (1929), 196
Storey, *J. Oil Chem. Ass.* **15** (1932), 33
Smith, *ibid.* **20** (1937), 307
BIOS 1272
FIAT 814, 57

Standards

BS 306 : 1952 (Black iron oxide for paints)
BS 1014 : 1942 (Black and brown oxides of iron pigments for cement)
USA Fed. Spec. TT-I-698 (1) (Synthetic black iron oxide); ASTM D769-48; TT-P-390 Black iron oxide, synthetic, dry
Fed Spec. TT-I-702 (Synthetic brown iron oxide); ASTM D84-51; TT-P-395 Brown iron oxide, synthetic, dry
Argentina IRAM 1957 1151 Coloured artificial iron oxide for paints
Australia K 61
Egypt EOS 1963 387 Natural Oxides of Iron for paints; EOS 1963 398 Standard methods of physical and chemical tests for iron oxides for paints
Germany DIN 55913
Holland NEN 5268:1964 (Pigments: methods of tests for Black Iron Oxide)
India IS 44

77500 C.I. Pigment Brown 29 (Brown)

$(\text{Fe}, \text{Cr})_2\text{O}_3$

Chromium Iron Brown: mixed phase pigment based on iron oxide-chromium oxide and corresponding approximately to the above formula

Solubility—insoluble in water, acids, ammonia and caustic soda
Egypt EOS 1963 398 Standard methods of physical and chemical tests for iron oxides for paints

77505 C.I. Pigment Yellow 45

Iron chromates of varying composition, e.g.

$<50\% \text{Cr}_2\text{O}_3$, $21\% \text{Fe}_2\text{O}_3$, $16\% \text{K}_2\text{O}$ or $<21\% \text{Cr}_2\text{O}_3$ and $30\% \text{Fe}_2\text{O}_3$

Basic ferric chromate $\text{Fe}(\text{OH})\text{CrO}_4$

Ferric dichromate $\text{Fe}_2(\text{Cr}_2\text{O}_7)_3$

(1) Precipitate boiling aqueous ferric chloride with potassium dichromate, add caustic soda until only just acid to litmus and wash the precipitate free of chlorides

(2) Fuse sodium dichromate with ferrous sulfate and soda ash

Ferric dichromate is used as a water-soluble pigment. It is obtained by heating aqueous chromic acid with moist ferric hydroxide

Literature

BIOS 1402, 136, 230
Bersch, 156

Chrome Black Chromium oxide (1 part) fused with ferric oxide (1) yields a deep black pigment for ceramics

77510 C.I. Pigment Blue 27

Ferric ferrocyanide $\text{Fe}_4^{\text{III}}[\text{Fe}^{\text{II}}(\text{CN})_6]_3 \cdot \text{XH}_2\text{O}$
or $\text{Fe}^{\text{III}}[\text{Fe}^{\text{II}}\text{Fe}^{\text{III}}(\text{CN})_6]_3 \cdot \text{XH}_2\text{O}$

Prussian Blue

In commercial products potassium or sodium is also present so that the blues are described commercially as potassium, sodium or ammonium blues

(1) Precipitate a solution of a ferrous salt with potassium ferrocyanide, wash the white precipitate of ferrous ferrocyanide and oxidise, e.g. with sulfuric and nitric acids or ferric sulfate. When fully oxidised, wash with water until neutral and dry at moderate temperature

(2) Run ferrous sulfate solution into aqueous sodium or potassium ferrocyanide. Oxidise the pale blue precipitate to Prussian Blue with sulfuric acid and sodium chlorate, wash free of acid and dry. This method gives better control of the oxidation and of particle size which in turn determines the tone and bronziness of the product

(3) Precipitate potassium ferrocyanide with a ferric salt

Milori Blue is lighter in hue and softer in texture than Prussian Blue

Gas Blues are made direct from gas liquors instead of crystallised ferrocyanide

Chinese Blue is considered the finest grade of Prussian Blue, it has a greenish undertone whereas ordinary Prussian Blue has a violet undertone

Bronze Blue, a variety of Prussian Blue showing a bronzy sheen when viewed from a certain angle. Mainly used in printing inks

Steel Blue is a greenish variety of Prussian Blue

Antimony Blue Add dilute aqueous potassium ferrocyanide to a clear solution of antimony in aqua regia

Reactions

Decomposed by alkalis to give brown ferric oxide unaltered by dilute mineral acids

Aqueous suspension turned green by chlorine but goes blue again on washing with water

Dissolves to blue solution in oxalic acid but reprecipitated suddenly on exposure to sunlight

Dissolves to colourless solution in alcoholic hydrochloric acid

Gives a white paste with sulfuric acid which turns blue on dilution

Discoverer — The earliest of the modern synthetic pigments being first made by Diesbach in 1704

Literature

- Woodward, *Phil. Trans.* (1724)
Heine & Höchtlen, *Ann.* **337** (1904), 1
Hantzsch, *Z. physical Chem.* **72** (1910), 362
Müller, *Chem. Z.* **38** (1914), 281, 328; **51** (1927), 923
Fritz, *Chem. Umschau*, **27** (1920), 242
Reihlen & Zimmermann, *Ann.* **451** (1927), 75; **475** (1929), 101
Cambi & Clerici, *Gazz.* **58** (1928), 57
Davidson & Wels, *J. Phys. Chem.* **32** (1928), 1191
Reihlen & von Kummer, *Ann.* **469** (1929), 30
Kugel, *Koll. Z.* **51** (1930), 240
Astrington & Hancock, *J. Oil Col. Chem. Assocn.* **14** (1931), 272
Keggin, *Nature*, **137** (1936), 577
BIOS 1402, 13
Cambi, *Gazz.* **77** (1947), 575
Cambi, Bertone & Marzorati, *Gazz.* **78** (1948), 448
Emschwiller, *Compt. rend.* **226** (1948), 1278
Schaeppi & Treadwell, *Helv. Chim. Acta*, **31** (1948), 577
Saxena & Bhattacharya, *J. Indian Chem. Soc.* **28** (1951), 703
Bhattacharya & Sexton, *ibid.* **29** (1952), 263
Bhattacharya & Saxena, *ibid.* **284**, 529, 535, 632; **28** (1951), 141, 221
Trillat & Barbezat, *Peintures, Pigments, Vernis*, **28** (1952), 604
Beck, *Engineering Papers of the Dept. of Paints & Lacquers of the Textilingenieurschule (Färbereischule) Krefeld No. 144; Deut. Farben Z.* **6** (1951), 231
Fritz, *Deut. Farben Z.* **8** (1954), 7
Remington & Francis, 94
American Cyanamid Co., *Nitrogen Chemicals Digest*, Vol. VII.
"The Chemistry of the Ferrocyanides", New York (American Cyanamid Co., 1953)
Bersch, 179 (Antimony Blue), 196, 201 (Chinese Blue), 199 (Prussian Blue), 200 (Mineral Blue), 201 (Soluble Prussian Blue)
Manual, 265, 695 (Prussian Blue on textiles), 696 (Napoleon's Blue on textiles)
Parnell, *Dyeing & Calico-Printing* (London 1849), 40, 168
Knecht & Fothergill, 254, 427, 585, 705, 840
Standards
BS 283:1965; BS 2876:1957
USA ASTM D261-47
Holland N885
India IS 56
Japan J IS K 5113
Sweden SIS 16 04 11 (Steel blue)

77515

Compound of tungstic oxide with the double cyanide of iron and tin
Dissolve separately sodium tungstate (10 parts), tin crystals (8), yellow prussiate (5) and ferric chloride (1) and mix the solutions. Wash the precipitate and expose it in thin layers to light for several days when it turns blue

77520 C.I. Pigment Blue 27

C.I. Pigment Green 15 (component)

Potassium ferric ferrocyanide $\text{KFe}^{\text{III}}[\text{Fe}^{\text{II}}(\text{CN})_6] \cdot \text{XH}_2\text{O}$
or $\text{K}[\text{Fe}^{\text{II}}\text{Fe}^{\text{III}}(\text{CN})_6] \cdot \text{XH}_2\text{O}$

the potassium may be replaced by sodium or ammonium

(1) Dissolve Prussian Blue, C.I. 77510, in excess potassium ferrocyanide or oxalic acid

(2) Mix cold solution of ferric chloride with excess potassium ferrocyanide

Literature

- Skraup, *Ann.* **186** (1877), 371
Hofmann et al, *ibid.* **337** (1904), 1
Eibner & Gerstaecker, *JSCI*, **31** (1912), 1041

Solubility

Very soluble in water

77525 C.I. Pigment Green 16 (component)

Ferrous ferricyanide $\text{Fe}^{\text{II}}\text{Fe}_2^{\text{III}}[\text{Fe}^{\text{II}}(\text{CN})_6]_2 \cdot \text{H}_2\text{O}$
or $\text{Fe}^{\text{II}}[\text{Fe}^{\text{II}}\text{Fe}^{\text{III}}(\text{CN})_6] \cdot \text{H}_2\text{O}$

Turnbull's Blue

(1) Treat an aqueous paste of Prussian Blue, C.I. 77510, with 3-5% of oxalic acid

(2) Precipitate potassium ferricyanide with a ferrous salt and wash the product until soluble in water

Literature

- Müller, *J. pr. Chem.* **90** (ii) (1914), 119
Bhattacharya & Saxena, *J. Indian Chem. Soc.* **29** (1952), 529

77530

Iron-zinc ferrocyanide

Antwerp Blue

Precipitate a solution of zinc sulfate (2 parts) and ferrous sulfate (1-2, according to depth of hue required) with a dilute solution of potassium ferrocyanide

A mixture of Prussian Blue, C.I.77510, and aluminium hydroxide, C.I.77002, is also sold as Antwerp Blue — *Remington & Francis* 197

Literature

Treadwell & Chevvet, *Helv. Chim. Acta*, **6** (1923), 559
Rechlen & Zimmermann, *Ann.* **451** (1927), 75

77533Ferric ferricyanide $\text{Fe}^{\text{III}}[\text{Fe}^{\text{III}}(\text{CN})_6]$ **Berlin Green**

Precipitate potassium ferricyanide with ferric chloride

Literature

Bhattacharya & Saxena, *J. Indian Chem. Soc.* **29** (1952), 263
Saxena & Bhattacharya, *ibid.* **31** (1954), 53

77535

Ferrous ammonium phosphate

A pigment having pronounced anti-corrosion properties, frequently used in small amounts to augment the anti-corrosion properties of iron oxide, C.I.77491-2 and 77499, and zinc chromate C.I.77955

Literature

Grimm, *USP* 2419017

77538 C.I. Pigment Red 101 and 102Ferric silicate $\text{Fe}_2\text{O}_3 \cdot \text{SiO}_2$

A constituent of the natural **Indian Red** from the Persian Gulf

77540Black iron sulfide FeS

Used in hair dyeing either by treating the hair with an iron salt or by double decomposition *in situ* of a soluble iron salt and a sulfide. Also used as a ceramic pigment

Literature

Redgrove & Bari-Woolls, *Hair Dyes & Hair Dyeing*, London (1939)

77543 C.I. Pigment Black 12Iron titanate FeTiO_3

Occurs naturally as ilmenite or titaniferous iron ore. It is not so heavy as black iron oxide and free from the tendency to "float" possessed by carbon blacks

Discoverer — Introduced as a black pigment by J. W. Ryland of Birmingham in 1865

77570

Lanthanum compounds

Used as colourisers for glass and ceramics

Standard

BS 283:1965

77575 C.I. Pigment Metal 4

Metallic lead

By roasting and reduction principally from the ore galena

77577 C.I. Pigment Yellow 46Litharge PbO

Can exist in two crystalline forms — the yellow orthorhombic and the red tetragonal, the temperature of transition being 587°C, and in an amorphous form

Natural occurrence as *massicot*

Manufacture

(1) **Litharge** (the crystalline form) is obtained as a byproduct when smelting lead ores

(2) **Massicot** (the amorphous form) is obtained by heating White Lead, C.I.77597, lead nitrate or Red Lead, C.I.77578, or by heating molten lead in air so that the oxide formed does not melt

Literature

Jaeger & Germs, *Z. anorg. Chem.* **119** (1921), 145
Kohlschütter & Scheerer, *Helv. Chim. Acta*, **7** (1924), 339

Standards (Litharge)

India IS 58
Roumania STAS 100 & 851

77578 C.I. Pigment Red 105

Plumbic tetroxide or lead orthoplumbate Pb_3O_4

- (1) Oxidise lead or Litharge, C.I.77577 or White Lead, C.I.77597, at ca. 450°C
- (2) Fuse lead sulfate with soda ash and excess sodium nitrate
- (3) Oxidise lead at 350–400°C to Massicot, C.I.77577, which is then ground in water to remove metallic lead, crushed, dried and oxidised at 450°C

Literature

Dumas, *Ann. chim.* **49** (x) (1832), 398
Levol, *ibid.* **75** (x) (1840), 108
Milbaver, *Chem. Z.* **33** (1909), 552, 950; **34** (1910), 139, 1341; **38** (1914), 477, 559, 566, 587; **39** (1915), 858
Brown & Nees, *J. Ind. Eng. Chem.* **4** (1912), 867
Reinders & Hamburger, *Z. anorg. Chem.* **89** (1914), 71
Chater, *J. Oil Col. Chem. Soc.* **24** (1941), 144
BIOS 1655
Jogarao, *J. Sci. & Ind. Research (India)*, **7B** (1948), 7, 91
Gruhl, *Z. Erzbergbau und Metallhüttenw.* **3** (1950), 319
Remington & Francis, 145
Thorpe, **7**, 243

Standards

BS 217:1961
USA ASTM D83–41; 1964 K161 Methods of Chemical Analysis of Dry Red Lead; GSA 1964 TT–R–00191c Red Lead Dry and Paste in Oil
Belgium NBN249
Egypt EOS 1963 386 Red Lead for Paints
France T 31–004
Holland N881 and NEN 1961 881 (methods of test for red lead)
India IS 58
Sweden SIS 1956 16 00 22 Red Lead, methods of test for; SIS 1957 16 04 01 Red Lead

Reactions

Becomes redder then violet on heating, regaining its hue on cooling. Decomposed by hydrochloric and sulfuric acids

77579

Lead sesquioxide Pb_2O_3

Gently heat metallic lead

Used in U.S.A. as a pigment in paint and for colouring ceramics

77580

Lead peroxide PbO_2

Occurs naturally as *plattnerite*

To obtain the synthetic product **Lead Brown** treat red lead with nitric acid to remove the lead monoxide, wash and dry

It is the brown pigment present in safety-match heads

Literature

Fehrmann, *JSCI*, **1** (1882), 407
Mina, *ibid.* 940
Friedrich, Mallet & Guye, *Monit. Sci.* **20** (1906), 514
Panopolus, *Chem. Z.* **40** (1916), 339
Zotier, *Bull. Soc. chim.* **21** (iv) (1917), 244
Reinders & Hamburger, *Z. anorg. Chem.* **89** (1914), 71

77585

Lead aluminate $\text{PbO} \cdot \text{Al}_2\text{O}_3$

Prepared from litharge and alumina

A useful white pigment, unaffected by hydrogen sulfide, resistant to dilute acids and has covering power equal to that of white lead

77588 C.I. Pigment Yellow 41 (Bright greenish yellow → Reddish yellow)

Lead antimonate $\text{Pb}_3(\text{SbO}_4)_2$ or lead metantimonate $\text{Pb}(\text{SbO}_3)_2$

(1) Heat a mixture of tartar emetic, lead nitrate and sodium chloride for 2 hr. at 800°C. Addition of a little alumina results in a brighter product

(2) Heat antimony oxide, lead nitrate, zinc oxide and potassium nitrate at 1000°C

(3) Heat Red Lead C.I.77578, antimony oxide, zinc oxide, potassium and lead nitrates at 1000°C

(4) Add aqueous lead nitrate at 80°C to a dry mixture of White Lead, C.I.77597, and antimony oxide, then an aqueous paste of lead chloride, dry and calcine at 550°C

Literature

BIOS 1402, 166
Remington & Francis, 57

77589 C.I. Pigment Yellow 41

Lead antimonate + zinc and bismuth oxides $\text{Pb}_3(\text{SbO}_4)_2 + \text{ZnO} + \text{BiO}$

(1) Fuse bismuth (3 parts), antimony sulfide (24) and potassium nitrate (64), grind, wash and dry. Fuse this product (1) with ammonium chloride (8) and Litharge, C.I.77577 (128)

(2) Add finely powdered antimony trisulfide (1) gradually to sodium nitrate (5) at red heat, boil with water and precipitate the solution with lead acetate

Discoverer — Used in Babylon ca. 600 B.C.

Literature

Bersch, 149 (Naples Yellow), 151 (Antimony Yellow)

77592 C.I. Pigment Yellow 30 (Greenish yellow → Yellow)Lead oxychloride $\text{PbCl}_2 \cdot 5-7\text{PbO}$

Varies in hue from lemon to dull sulfur yellow depending on the lead oxide content

(1) Fuse lead oxide (10 parts) with ammonium chloride (1), separate the metallic lead and grind

(2) Stir Litharge, C.I. 77577, (4) with 20% brine (5) for 24 hr, wash, ignite, grind, levigate and dry

Literature

Bersch, 113 (Cassel and Montpelier Yellows), 149 (Turner's or English Yellow)

Solubility

Slightly soluble in water

77593 $\text{Pb(OH)}_2 \cdot \text{PbCl}_2$ **Pattinson's White**

Occurs naturally as laurionite, manufactured by dissolving galena in hydrochloric acid and precipitating the basic chloride by adding half the equivalent of lime water

Discoverer — Pattinson 1844

Literature

Bersch, 113

77596 C.I. Pigment White 1 (note)Lead carbonate PbCO_3

Occurs naturally as *cerussite*

Precipitate lead nitrate with soda ash

77597 C.I. Pigment White 1Basic lead carbonate $3\cdot6\text{PbCO}_3 \cdot \text{Pb(OH)}_2$ to $1\cdot8\text{PbCO}_3 \cdot \text{Pb(OH)}_2$

(1) *Dutch or Slow Process.* Thin sheet lead is rolled into spirals and covered with acetic acid and spent willow tan bark. The ensuing fermentation raises the temperature to ca. 45°C and basic lead acetate is formed. This is converted to the normal carbonate by the carbon dioxide from the fermentation leaving neutral lead acetate which attacks more lead. The whole process takes 3 months

(2) *Quick or Carter Process.* Granulated lead is sprayed with aqueous acetic acid while in revolving drums and then carbon dioxide passed in. The process takes 6-14 days

(3) *Mild Process.* Molten lead is atomised with steam at above the m.p. of lead. The product is made into an aqueous paste, oxidised by air and then treated with carbon dioxide

(4) *German Chamber Process.* Lead is hung in a closed chamber and given prolonged treatment with steam, carbon dioxide and acetic acid vapour

(5) *French Process.* Dissolve Litharge, C.I. 77577, in acetic acid and pass in carbon dioxide under pressure. This precipitates basic lead carbonate and the neutral lead acetate formed is treated with more Litharge

(6) *Octagon Process.* Thin ribbons of lead are oxidised in air, the oxide dissolved off in normal lead acetate, the lead again exposed to air and then again treated with the acetate liquor. This is repeated until a solution containing thrice as much lead as the normal acetate is got. This liquor is treated in closed tanks with carbon dioxide to precipitate the white lead and leave a solution of normal lead acetate which goes back to the plant

Discoverer — Manufacture described by Dioscorides in the fourth century B.C.

Bergmann, 1774, first showed that it was a carbonate

Literature

Eland, *BP* 2/1622

Creed, *BP* 651/1749

Fishwick, *BP* 1581/1787

Ismay, *BP* 23969/1895

Hawley, *J. Physical Chem.* **10** (1906), 654

Weiner, *Ber.* **40** (1907), 4441

Holley, *JSCI*, **28** (1909), 403

Thompson, *ibid.* 407

Euston, *J. Ind. Eng. Chem.* **6** (1914), 202, 382

Mattiello, *Protective and Decorative Coatings*, Vol. 2, N.Y. (1942), 337

Loon, *Verfkroniek*, **17** (1944), 2, 14

Thorpe, **7**, 254

Heaton, *Outlines of Paint Technology*, 3rd Ed., London (1947), 54

Vignola, *Ind. Vernice*, **2** (1948), 139

Philip, *Paint*, **19** (1949), 388

Venkateswarlu, *J. Sci. Ind. Res. (India)*, **9B** (3) (1950), 67

Remington & Francis, 1

Bersch, 75

Standards

BS 239 :1967; BS 2876 :1957

USA ASA K 23-1; Fed. Spec. TT-W-251b (2)

Argentina IRAM 1009

Australia K 9 and 10

Belgium NBN 140

Canada I-GP-9 and 9d

France AFNOR T 31-005

Holland NEN 680, 878 and 888

India IS 34

Japan JIS K 5103

Mexico K 37

Pakistan PS106:1960

Poland C 624

S. Africa SABS 36 and 44

Spain UNE 1956 48042

Sweden SIS 16 00 14 and 16 04 03

USSR GOST 10275 (Lead Carbonate, medium)

77600 C.I. Pigment Yellow 34
C.I. Pigment Green 15 (component)

Lead chromate PbCrO_4

Occurs naturally as crocoite

The synthetic product is made in various ways, e.g.

(1) Treat litharge, lead acetate or nitrate with sodium chromate or dichromate in wooden vats, wash, filter, press and dry

(2) Treat a solution or suspension of lead salts with sodium dichromate. The hue of the precipitate may be varied from light primrose to orange by varying the pH and the temperature, cf. basic lead chromate, C.I. 77601, and lead sulfochromates, C.I. 77603

Acetate chromes a range of lead chrome pigments derived from lead acetate or basic acetate, they vary from primrose to orange

Literature

USP 2023928
Vauquelin, *Ann. de Chimie*, **70** (1809)
Milbauer & Kohn, *Z. phys. Chem.* **91** (1916), 410
Palmer, *J. Oil Col. Chem. Assocn.* **8** (1925), 90
Wagner & Keide, *Farben-Z.* **31** (1926), 1567
Ernst, *Ind. Eng. Chem.* **24** (1933), 227
Ishibashi & Funakoshi, *J. Chem. Soc. Japan*, **57** (1936), 1028
Bratu, Piatowski & Theodorescu, *Bul. Inst. Nat. Cercetari Tehol.* **2** (1947), 50
Karaus & Tabellini, *Pittura e vernici*, **4** (1948), 223
Clay & Watson, *J. Oil Col. Chem. Assoc.* **31** (1948), 418
Oschmann, *Peintures, Pigments et Vernis*, **27** (1951), 559
Panfilov & Bochkov, *Zhur. Priklad. Khim.* **26** (1953), 681
Scheifle, *Paint, Oil & Col. J.* **126** (1954), 637
Watson & Clay, *J. Oil Col. Chem. Assocn.* **38** (1955), 167
Remington & Francis, 102
Parnell, *Dyeing & Calico-Printing* (London 1849), 36, 169
Manual, 690
Knecht & Fothergill, 253, 425, 584, 838

Standards

BS 282, 389:1963; BS 2876:1957 (Chrome yellows and oranges, Chrome lemon, Chrome middle); BS 303:1953 (Brunswick or Lead Chrome Greens for paints)
USA ASA K 27-1; ASTM D211-47; Fed. Spec. TT-C-290 (3); ASA K 58-1. Methods for chemical analysis of yellow, orange and green pigments containing lead chromates and chromium oxide green (ASTM D126)
Argentina IRAM 1046
Australia K 74
Holland NEN 1964 884 Pigments. Test methods for Chrome Yellow
India IS 50
Poland PN C620
S. Africa SABS 64
Uruguay UNIT 85

77601 C.I. Pigment Orange 21 (Yellowish orange)
C.I. Pigment Orange 45 (Orange) → Reddish orange)
C.I. Pigment Red 103 (Reddish orange → Red)
C.I. Pigment Green 15 (component)

Discoverer — Vauquelin 1809

Literature

Holley, *Analysis of Paint and Varnish Products*, London (1912), 303
Wagner & Schirmer, *Z. anorg. Chem.* **222** (1935), 245
Clay & Watson, *J. Oil Col. Chem. Assocn.* **31** (1948), 418
Karaus & Tabellini, *Pittura e vernici*, **4** (1948), 223, 303
Scheifle, *Paint, Oil & Col. J.* **126** (1954), 637
BIOS 1402, 72
Remington & Francis, 102
Parnell, *Dyeing & Calico-Printing* (London 1849), 39, 170
Manual, 691
Knecht & Fothergill, 253, 426, 838

Standards

BS 282, 389:1963; BS 2876; 1957
USA Fed. Spec. TT-C-29 (3); ASTM D211-47; TT-P-00615a
Primer coating, basic lead silico-chromate, ready made
Holland NEN 1965 5265 Pigments: test methods for Chrome Orange
S. Africa SABS 64

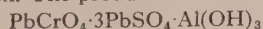
77603 C.I. Pigment Yellow 34 (Greenish yellow → Yellow)
C.I. Pigment Green 13 and 15 (components)

Lead sulfochromates $\text{PbCrO}_4 \cdot x\text{PbSO}_4$

(1) Co-precipitate mixtures of 40–50% PbSO_4 :60–50% PbCrO_4 to produce primrose chromes and 20–30% PbSO_4 :80–70% PbCrO_4 for lemon chromes. The PbSO_4 is not a diluent as its function is to stabilise the hue. The products are neither mixtures nor double salts, the PbSO_4 being present seemingly in solid solution in the PbCrO_4

(2) Run an almost neutral mixture of sodium dichromate and sodium sulfate into a solution or suspension of a lead salt

(3) Primrose chromes may be produced by adding aluminium sulfate to the dichromate before precipitation, and the aluminium is finally precipitated by soda ash. The products are of the type



Rhombic chrome yellow is less fast to light than the monoclinic variety

Literature

USP 2023928
Milbauer & Kohn, *Chem. Z.* **46** (1922), 1145
Wagner & Keide, *Farben Z.* **31** (1926), 1567
Wagner, *Paint & Varnish Prod. Man.* **10** (5) (1934), 10
Lederle, *Rev. Prod. Chim.* **40** (1937), 263
Clay & Watson, *J. Oil Col. Chem. Assocn.* **27** (1944), 5; **31** (1948), 418
Karaus & Tabellini, *Pittura e vernici*, **4** (1948), 223
Haug, *Deut. Farben-Z.* **5** (1951), 343
Scheifle, *Paint, Oil & Col. J.* **126** (1954), 637
Remington & Francis, 102

Standard

BS 282 : 1953

77605 C.I. Pigment Red 104

Lead chromate-lead molybdate mixed crystals usually containing some sulfate

Pour sodium dichromate, sulfuric acid and sodium molybdate into excess lead nitrate, preferably cold at pH 3. The products vary according to proportions of constituents and conditions of precipitation from orange to red

Literature

USP 1926447
Linz, *Ind. Eng. Chem.* **31** (1939), 298
Coffer & McCoy, *Amer. Ink Maker*, **25** (1947) (1-4)
BIOS 1402, 114
FIAT 804 (Molybdate Red G, M, B and Bx)
Remington & Francis, 102

Standard

USA TT-P-410 Molybdate orange
India IS 50

77607

Lead dichromate

Used as a reddish brown pigment in the U.S.A.

Reactions

Decomposed by water

77610 C.I. Pigment Yellow 48 (Greenish yellow)

Lead cyanamide $\text{Pb}(\text{CN})_2$

Extract commercial calcium cyanamide with water, add a little lead nitrate to precipitate the black sulfides, filter and heat the filtrate with lead nitrate and ammonia to precipitate the yellow lead cyanamide

Discoverer — IG (Höchst) ca. 1928

Literature

BP 464638; USP 2213545
Zirngibel, *Fette u. Seifen*, **53** (1951), 740
Vlieger, *Chem. Weekblad*, **47** (1951), 831
Stock & Blum, *Deut. Farben-Z.* **5** (1951), 317
Korinth, *Angew. Chem.* **64** (1952), 265
FIAT 681, 51
Remington & Francis, 115
Paint, **23** (1953), 374

77613

Lead di-iodide PbI_2

A golden yellow pigment used in bronzing, mosaic gold and in printing. It is very slightly soluble in water and has poor fastness to light

Literature

Bersch, 154

77620

Dibasic lead phosphite $2\text{PbO} \cdot \text{PbHPO}_3 \cdot \frac{1}{2}\text{H}_2\text{O}$

Fine acicular crystals forming a white pigment of high tinting strength and covering power, used as a stabiliser in vinyl plastics

Literature

National Lead Co. USP 2483469

77622 C.I. Pigment White 30

Lead phosphate $\text{Pb}_3(\text{PO}_4)_2$

Used as the pigment in some substitutes for Pearl Essence (C.I. Natural White 1)

77625 C.I. Pigment White 16

Lead silicate

(1) Treat lead sulfate in presence of water with a silicate of an alkaline earth metal

(2) Grind a mixture of lead monoxide or hydroxide and silicic acid in water in presence of an acid catalyst — BP 637622

Literature

Goodlass Wall & Lead Industries, BP 637622, 641624;
USP 2563367

77629

Lead stannate

Used as a bright yellow to orange artists' pigment from the 15th to 17th centuries

For preparation and properties

see Denniger, *Mal technik*, (2), (1955), 38

77630 C.I. Pigment White 3

Lead sulfate PbSO_4

Occurs naturally as crocosite or crocoisite, orange-yellow monoclinic crystals, in Russia, Brazil, the Philippines, Rhodesia and Tasmania

The synthetic product, which is a white pigment, is obtained by precipitating a soluble lead salt with dilute sulfuric acid, an alkali sulfate or aluminium sulfate. The commercial product is often a by-product of the manufacture of aluminium acetate or triphenylmethane dyes

Literature

Richardson, BP 8305/1839
Marino, *Z. anorg. Chem.* **56** (1907), 233
Schenck & Rassbach, *Ber.* **41** (1908), 2918
Bannard, *JSCI*, **48** (1929), 335
Remington & Francis, 17

77633 C.I. Pigment White 2

Basic lead sulfate varying from $5\text{PbSO}_4 \cdot \text{PbO}$ to $2\text{PbSO}_4 \cdot \text{PbO}$

Some commercial products contain up to 5% zinc oxide

Originally made in the U.K. in 1882 by roasting high grade galena concentrates in a modified blast furnace. The volatilised lead sulfide is oxidised by a cold air blast and collected in a cooling chamber

Blue Lead is a blue-grey corrosion inhibiting pigment composed of $\leq 45\% \text{PbSO}_4$, $\leq 30\% \text{PbO}$, $\geq 12\% \text{PbS}$, $\geq 5\% \text{PbSO}_3$, 5% ZnO, $\geq 5\%$ Carbon and undetermined matter, obtained by heating lead ores in special furnaces

White Lead Sulfate a pigment of approximate composition $\text{PbSO}_4 \cdot 2\text{PbO}$ used because of its corrosion-inhibiting properties

Discoverers — G. T. Lewis 1866, in the U.S.A. by E. O. Bartlett in 1870

Literature

BP 2102/1869

Hughes, *JSCI*, **28** (1909), 405

Remington & Francis, 15

Thorpe, **9**, 627

Standards

BS 239 ... 637:1967

USA ASA 47-1; ASTM D82-44; Fed. Spec. TT-W-261a (2) (basic sulfate white lead); TT-W-261C White lead, basic sulfate, dry and paste-in-oil ASA 48; ASTM D405-41; Fed. Spec. TT-B-486 (2) (blue lead; basic sulfate)

India IS 39

Pakistan PS 110:1960

Spain UNE 1956 48039 (Pigments, basic sulfate of lead. Characteristics and method of test)

77640

Lead sulfide PbS

Occurs naturally as *galena* (*galenite*)

Used as a brown to black hair dye by being formed *in situ* by double decomposition of a soluble lead salt and a compound which forms a sulfide with it

Also used in ceramics

Literature

Redgrove & Bari-Woolls, *Hair Dyes and Hair Dyeing*, London (1939)

Cox, *Chem. & Ind.* **55** (1936), 780; *Analyst*, **63** (1938), 397

77645 C.I. Pigment Yellow 47 (Yellow to buff)

Lead titanate PbTiO_3

Heat titanium dioxide and litharge in molecular proportions, product contains lead sulfate and oxide as impurities

Literature

Robertson, *Ind. Eng. Chem.* **28** (1936), 216

Wachlotz, *Verfkroniek*, **26** (1953), 52

Standard

Holland V 1337; NEN 1964 2142 Pigments, methods of test for lead titanate

77650

Lead tungstate PbWO_4

Mix solutions of lead nitrate and sodium tungstate, concentrate and crystallise

A yellowish powder used, in U.S.A., as a pigment

Literature

Bersch, 128 (Tungsten White)

77711

Magnesium oxide MgO

Occurs naturally in the mineral *periclase*

The light variety is obtained by heating magnesium carbonate and the heavy variety by heating basic magnesium carbonate

Used as a white pigment in rubber, paper and cosmetics

Standard

India IS 2599:1963 (Magnesium oxide for the cosmetic industry)

77713 C.I. Pigment White 18

Magnesium carbonate MgCO_3

Occurs naturally as *magnesite*

Mix magnesium sulfate with soda ash, boil, filter, wash and dry to yield light magnesium carbonate

Heavy magnesium carbonate is either $5\text{MgCO}_3 \cdot \text{Mg}(\text{OH})_2 \cdot 3\text{H}_2\text{O}$ or $5\text{MgCO}_3 \cdot 2\text{Mg}(\text{OH})_2 \cdot 7\text{H}_2\text{O}$ or $4\text{MgCO}_3 \cdot \text{Mg}(\text{OH})_2$ or $3\text{MgCO}_3 \cdot \text{Mg}(\text{OH})_2 \cdot 4\text{H}_2\text{O}$ and corresponds to the natural variety

Used in U.S.A. as a rubber pigment and in magnesia inks. In U.K. used similar to whiting but owing to higher oil absorption chief use is in formulation of matt finishes

Standard

India IS 2528:1963 (Magnesium carbonate for the cosmetic industry)

77718 C.I. Pigment White 26

Mixed hydrated silicates of magnesium, calcium and iron with other compounds, average composition is SiO_2 49.81%, Al_2O_3 2.19%, Fe_2O_3 2.8%, MgO 27.96%, CaO 13.21% and H_2O 3.91%

Occurs naturally in many fibrous minerals, e.g. anthophyllite, hornblende, tremolite, actinolite, crocidolite, serpentine and talc

Literature

Ladoo, *Talc and Soapstone, their Mining, Milling, Products, and Uses*, U.S. Bureau of Mines (1923)
Düssel, *Chem. Z.* **48** (1924), 179
Spence, *Talc, Steatite and Soapstone, Pyrophyllite*, Can. Dept. Mines & Resources, Mines & Geol. Branch, No. 803 (1940)
Engel, *Talc and Soapstone*, Chap. 48 of *Industrial Minerals and Rocks*, Amer. Inst. Mining & Metallurgical Engineers, 2nd Ed. New York (1949) (has a good bibliography)
Hudson & Stanners, *J. Appl. Chem.* **5** (1955), 173
Thorpe **11**, 388

Standards

BS 1795:1965
USA Fed. Spec. TT-M-90; TT-P-0040 (Pigments, Magnesium Calcium Silicate, dry); ASTM D605-42
India IS 66

77726

Manganous oxide MnO

Manganese Green

Occurs naturally as manganosite

(1) Precipitate aqueous manganese sulfate with soda and strongly ignite the precipitate in absence of oxygen

(2) Precipitate manganese chloride with an alkali or alkaline earth hydroxide and simultaneously oxidise with air

(3) Reduce MnO_2 in H

(4) Heat carbonate in absence of air

Used in textile printing, ceramics and glass manufacture as a grass green pigment

Literature

Thorpe, **7**, 497
Bersch, 272

**77727 C.I. Pigment Brown 7 and 8
C.I. Natural Brown 8**

Manganic oxide Mn_2O_3

Occurs naturally, usually very impure, as *braunite*

Manufactured by igniting any other oxide of manganese or manganese carbonate, or nitrate in presence of air at $<940^\circ\text{C}$.

Caledonian Brown is a mineral pigment composed mainly of manganese and iron oxides and hydroxides

Cappagh Brown is a highly manganiferous and ferruginous earth obtained from the Cappagh mine in Ireland, see also C.I. Natural Brown 8

Literature

Bernal, *Chem. Soc. Annual Rep.* (1935), 211

77728 C.I. Pigment Black 14

Manganese dioxide MnO_2

Occurs naturally as pyrolusite and polianite but the commercial product is usually prepared from a mixture of pyrolusite, hausmannite (Mn_3O_4), braunite (C.I.77727) and other manganese ores. The regenerated manganese dioxide obtained from the manufacture of chloride, etc. It forms the second major constituent in umber (13–30% in the case of raw Turkey umber), occurs in some ochres and is a minor constituent of the siennas, see C.I.77491–2. Also used to colour glass violet

Literature

Storey, *J. Oil Col. Chem. Ass.* **15** (1932), 33
Bersch, 279 (Pyrolusite Brown)

77730 C.I. Pigment Brown 8

Manganic hydroxide, $\text{Mn}(\text{OH})_3$, together with manganese manganite $\text{MnO} \cdot \text{MnO}_2 \cdot \text{H}_2\text{O}$

Occurs naturally as manganite but the commercial product is usually synthetic and may be made in the following ways

(1) Precipitate manganous chloride (obtained from the manganese residues in the manufacture of chlorine by the Weldon process) with soda, wash the precipitated manganous hydroxide and air oxidise

(2) Precipitate manganous chloride with calcium hypochlorite and lime water, wash with dilute nitric acid and then with water

Wad is a term applied somewhat loosely to blackish material the chief constituent of which is a hydrous manganese oxide. Several varieties have been distinguished by special names. It is mined in many places with other oxides and manganese, principally for use in the manufacture of chlorine and pigments

Literature

Thorpe, **11**, 883
Parnell, *Dyeing & Calico-Printing* (London 1849), 39, 174
Manual, 693 (Manganese Brown or Manganese Bronze (Bistre) on textiles)

77733Manganous carbonate MnCO_3 *Literature*
*Thorpe, 7, 497***Manganese White**

Occurs naturally as *rhodochrosite* and in some other minerals
 Precipitate iron-free manganese chloride with soda ash
 Used as a paint pigment and in ceramics

77735Manganous chromate $2\text{MnO} \cdot \text{CrO}_3 \cdot 2\text{H}_2\text{O}$

Treat manganese chloride, MnCl_2 , with a solution of a dichromate to produce a brown pigment used in water colours and ceramics

77738Manganous fluoride MnF_2

Treat manganous hydroxide with hydrofluoric acid to obtain a reddish compound used as a ceramic colouriser

77742 C.I. Pigment Violet 16Manganese ammonium pyrophosphate $\text{Mn}^{+3}\text{NH}_4\text{P}_2\text{O}_7$

Heat syrupy phosphoric acid to 150°C , stir in dihydrogen ammonium phosphate and then gradually add manganese dioxide. When effervescence ceases bring to 320°C for 1 hr., quench in water, wash free of soluble salts and dry quickly at 90°C

Literature
 Barbier & Moisson, *Academie des Sciences* (Dec. 1902), 1109
 BIOS 1402, 148
 Bersch, 278
Standard
 BS 2875 : 1957 (**Mineral violet** defined as a complex manganese ammonium phosphate)

77745Manganous phosphate $\text{Mn}_3(\text{PO}_4)_2 \cdot 7\text{H}_2\text{O}$

Treat manganous hydroxide with orthophosphoric acid
 A pinkish compound used as a colouriser in ceramics

77748Manganous silicate MnSiO_3

Occurs naturally as *rhodonite*
 Treat a manganous salt with sodium silicate
 Red crystals or a yellowish red powder used in ceramics and for colouring glass

77752Manganous sulfate $\text{MnSO}_4 \cdot 4\text{H}_2\text{O}$

Treat manganous hydroxide or carbonate with sulfuric acid
 Has drying properties
 Used in U.S.A. in dyeing and printing

77755Potassium permanganate KMnO_4 Sodium permanganate NaMnO_4

An aqueous solution is used in hair dyeing and as a wood stain

77760Mercuric oxide HgO

(1) Treat mercuric chloride with caustic alkali or potassium carbonate
 (2) Treat mercuric nitrate with soda ash

Standards
 USA ASA K 59
 India IS 71
 Mexico DGN K14 (Red oxide of mercury)
 DGN K15 (Yellow oxide of mercury)
 Poland PN C 81013

77762Mercuric arsenate HgHAsO_4

Used in yellow waterproof and anti-fouling paints

Solubility
 Soluble in hydrochloric acid, slightly soluble in nitric acid

77764Mercurous chloride HgCl

Precipitate mercurous chloride under controlled conditions so as to form minute crystals having a pearly lustre. Used as a substitute for Pearl Essence, C.I. Natural White 1

Literature
 Shuman, *Paint, Oil & Chem. Rev.* 116 (8) (1953), 22

77766 C.I. Pigment Red 106

Mercuric sulfide HgS

Natural occurrence As mercury blende or cinnabar in Spain, Germany, Austria, Russia, China, Japan, Mexico, Peru and California

Manufacture

(1) Mix mercury with sulfur and agitate until the black (amorphous) sulfide is formed, this is then distilled and the vermilion (crystalline form) is condensed, wet ground, boiled with caustic soda, washed and dried

(2) Add excess ammonia to aqueous mercuric chloride, dissolve the precipitate in excess sodium thiosulfate and finally heat the mixture to 70–80°C

(3) Agitate mercury with aqueous sodium sulfide in presence of alkali

(4) Pass hydrogen sulfide into a solution of a mercury salt

Literature

Rose, *Centr. Min.* 1912, 527; *N. Jahrb. Min.* **29** (1900), 94
Thorpe, **7**, 576
Bersch, 166

Standards

BS 2876 : 1957 [Vermilion (orange, scarlet, Chinese)]
Poland PN C 81013

Reactions

Dissolves in aqua regia with liberation of sulfur
Sublimes when heated

77769Molybdenum oxide Mo₂O₃

Used as a greyish black pigment in ceramic glazes and in enamels for metals

Molybdenum Blue obtained by mixing sodium molybdate with aqueous stannous chloride and then washing and drying the precipitate is a mixture of stannic molybdate with the blue modification of molybdenum oxide. It is used as an artists' colour of great durability

77772

Neodymium compounds

Used as colourisers for glass and ceramics

Metallic neodymium can be used for ruby glass

77775

Nickel

(1) Reduce a nickel salt *in situ* with pyrogallol (in hair dyeing)

(2) Stamp the metal until reduced to powder or flake

(3) Produce the flake electrolytically cf. *USP* 2365356

77777

Nickel oxide NiO

Natural occurrence As *bunsenite*

Manufacture Heat nickel hydroxide or nitrate

Used as a green pigment for painting on porcelain and in ceramics for obtaining a delicate brown

77779Nickel carbonate NiCO₃Basic nickel carbonate 2NiCO₃·3Ni(OH)₂·4H₂O

Add soda ash to an aqueous nickel salt

Used in ceramics

77783Nickel phosphate Ni₃(PO₄)₂·7H₂O

Add sodium phosphate to aqueous nickel sulfate or nitrate and heat the pale green precipitate to redness

Used as an artists' colour of great permanence

77786

Nickel sulfide NiS

Produce *in situ* in hair dyeing by double decomposition of a nickel salt and a sulfur compound

77788 C.I. Pigment Yellow 53 (Greenish yellow)

Antimony oxide–nickel oxide–titanium oxide

Calcine antimony oxide, nickel oxide and titanium oxide together at high temperatures

77790

Ammonia-perchloride of Palladium

Palladium Red

77795

Platinum

Mix the precipitated oxide with a soft flux which reduces it to the metal in a ceramic kiln to produce a white metal decoration

Liquid bright platinum is an organic liquid containing platinum and gold. Fixed at ca. 1200°F it produces a silvery mirror film

77800Ammoniated ruthenium oxychloride $\text{Ru}_2(\text{OH})_2\text{Cl}_4 \cdot 7\text{NH}_3 \cdot 3\text{H}_2\text{O}$

A brownish red compound soluble in water used as a microscopic stain

77805

Selenium

Used for decorating ceramics and in producing ruby glass for which purpose it has largely replaced gold and copper, it is also used as a decolouriser for white glass

Literature

Sullivan & Austin, *J. Amer. Ceramic Soc.* **25** (1942), 123
Ashton, Hill & Neville, *Selenium*, H.M.S.O. (1954), 19

77811 C.I. Pigment White 27Silica SiO_2

Natural occurrence Extensively as sand, flint, quartz, kieselguhr and as *Milovite*, an amorphous powder of volcanic origin in the Greek island of Milo

Literature

Remington & Francis, 68
BIOS 681, 11 (Silcar)

Standards

BS 1795:1967 Silica natural and synthetic
India IS 67
USA ASTM D604-42

77813

Silicon carbide

Used to replace zinc oxide in acetone and fume-resistant paints and as a ceramic pigment

Literature

Hesse, *Farbe u. Lack*, **58** (1952), 156

77816

Silicon nitride

White and grey silicon nitride pigmented paints have superior resistance to abrasion and marked chemical inertness. Grey silicon nitride has good capacity and covering power and can be used alone, but white silicon nitride because of its inferior capacity and covering power needs another pigment to be used with it

Literature

Union Carbide & Carbon Corp., *USP* 2572252

77820

Silver

Silver flake is prepared by depositing silver electrolytically onto stainless steel balls in a rotating container, flaking the silver off and mildly ball-milling it. It is almost black and is used for colouring watch dials and the like. What are popularly known as "silver" powder and paint are, in fact, aluminium powder and aluminium paint

Silver powder is prepared by adding zinc to aqueous silver nitrate. This yields a grey powder which after being applied to a surface can be buffed to produce the typical metallic lustre of silver

Produced *in situ* in ceramics by using the oxide in a soft flux which reduces the oxide to the metal in the kiln

Produced *in situ* as a hair dye by treating the hair with a solution of silver salt which has been treated with ammonia until just alkaline after the precipitate has been dissolved, and then treating the impregnated hair with pyrogallol

Shell Silver consists of silver leaf rubbed down with a solution of gum and then dried. It is used as an artists' colour particularly for illuminating manuscripts

Literature

Redgrove & Bari-Woolls, *Hair Dyes and Hair Dyeing*, London (1939)
Greenwood, *Paint*, **19** (1949), 303, 314
Wendon, *JSDC*, **71** (1955), 125
Bersch, 327 (Shell Silver)

77822Silver oxide Ag_2O

Precipitate silver nitrate with alkali hydroxide

Used in ceramic glazes and for colouring glass yellow

77825

Silver chromate Ag_2CrO_4

Precipitate silver nitrate with potassium chromate

Used as an artists' colour under the name of **Purple Red**

77830

Black silver sulfide Ag_2S

Natural Occurrence as *silver glance*

Manufacture

(1) Precipitate silver nitrate with hydrogen sulfide

(2) Prepare *in situ* as a hair dye by double decomposition of silver nitrate and an alkaline sulfide

Used in ceramics; also for inlaying in "niello" metal work

Literature

Redgrove & Bari-Woolfs, *Hair Dyes and Hair Dyeing*, London (1939)

77837

Strontium carbonate SrCO_3

Used in pyrotechnics and iridescent glass. Occurs naturally as *strontianite*

77839 C.I. Pigment Yellow 32

Strontium chromate SrCrO_4

Standard

BS 4313:1968 Strontium chromate for paints
Germany DIN 55 903

Solubility

Slightly soluble in water (1–2 g./l.), readily soluble in hydrochloric or nitric acid and slightly soluble in acetic acid

Precipitate a strontium salt with neutral aqueous potassium chromate

77845

Strontium sulfate SrSO_4

Natural occurrence as *celestite* at Yate near Bristol, a white transparent mineral tinted pink because of traces of iron

Manufacture Convert celestite into strontium chloride and then precipitate with sulfuric acid

77847 C.I. Pigment White 8

Strontium sulfide SrS

Literature

Stöckmann, *Naturwissenschaften*, **39** (1952), 226
BIOS 814, 65

Standards

BS 1316 : 1946 (Strontium sulfide type of fluorescent and phosphorescent material)

The initial brightness of strontium sulfide type phosphors is lower than that of the zinc sulfide type, the duration of afterglow is longer and the resistance to weathering much lower

Mixed strontium calcium sulfides are also used as phosphors

Heat a mixture of strontium sulfate, sulfur and an activator (mainly arsenic, copper, silver or manganese) to bright red heat in a closed graphite crucible

77850

Strontium diuranate SrU_2O_7

Used for colouring porcelain yellow

77855

Tellurium

Literature

Thorpe, **11**, 454, 461

Natural occurrence In the free state usually in association with silver and gold tellurides and some sulfides

Manufacture Practically all commercial tellurium is recovered from the flue dust of sulfide smelting and from the anode slimes deposited in the electrolytic refining of copper

Used for decorating ceramics

77860 C.I. Pigment Metal 5

Tin

Literature

Thorpe, **11**, 618

Silver matt powder is an alloy of 96.46% tin, 2.30% zinc and 0.03% iron

| | |
|--|--|
| 77861 C.I. Pigment White 15 Stannic oxide SnO_2 Natural occurrence as <i>cassiterite</i> Manufacture (1) Burn tin in air (2) Refine the tin ash from making tin plates (3) Precipitate stannic chloride with ammonia (4) Precipitate an alkali stannate with acid Used in white enamels and for ceramics | Literature Thorpe, 11 , 627 Wagner, <i>Die Körperfarben</i> , 163 |
| 77864 Stannous chloride SnCl_2 Hydrated stannous chloride $\text{SnCl}_2 \cdot 2\text{H}_2\text{O}$ An alkaline solution in which the tin exists as the stannite ion is used for silvering glass and plastics | Literature Thorpe, 11 , 628 Reactions The anhydrous chloride is readily soluble to a clear aqueous solution which remains stable for some days. The hydrated chloride is readily hydrolysed by water and yields a cloudy solution |
| 77866 Stannous chromate SnCrO_4 Treat stannous chloride with sodium chromate Used for decorating porcelain brown | |
| 77870 Stannic chromate $\text{Sn}(\text{CrO}_4)_2$ Fuse stannic oxide (100 parts) with chromic oxide (2) Used for brown decorations in ceramics | Solubility Partly soluble in water |
| 77873 Basic tin nitrate Dissolve tin in fuming nitric acid and pour into a large volume of water to yield a white pigment used in cosmetics | Literature Bersch, 130 (Tin White) |
| 77878 C.I. Pigment Yellow 38 Stannic sulfide SnS_2 (1) Heat stannous chloride (100 parts) with flowers of sulfur (50) to obtain a pale yellow product (2) Heat 50% tin amalgam (50), stannous chloride (25), flowers of sulfur (35) and ammonium chloride (35) to obtain a reddish yellow product (3) Form <i>in situ</i> as a yellow hair dye by double decomposition of a soluble tin salt and a sulfide | Discoverer — In the seventeenth century already known as <i>Aurum mosaicum</i> , <i>musicum</i> or <i>musivum</i> Literature Lagutt, <i>Z. angew. Chem.</i> 10 (1897), 557 Hadert, <i>Chem. Z.</i> 50 (1926), 7 Bersch, 160 Chrysean similar in appearance to Mosaic Gold was obtained by passing hydrogen sulfide through saturated aqueous potassium cyanide to precipitate $\text{C}_4\text{H}_5\text{N}_3\text{S}_3$ |
| 77891 C.I. Pigment White 6 Titanium dioxide TiO_2 Ilmenite, $\text{FeO} \cdot \text{TiO}_2$, a natural mineral, is digested with sulfuric acid, the solution hydrolysed and the precipitated titanium dioxide separated, calcined and ground. Some commercial grades are reduced with barium sulfate or calcium sulfate. The rutile variety is also mined The pigment exists in three forms (a) <i>Anatase</i> which has great tendency to chalk on exposure but which has good hiding power (b) <i>Rutile</i> a thermostable variety having little tendency to chalk (c) <i>Brookite</i> an orthorhombic variety of little importance Standards BS 2876:1957; 1014:1961 Titanium Oxide (including rutile and anatase) for cement; BS 239 . . . 1851:1967 USA ASA K45 & 48, ASTM D476-82 & 45-1, Fed. Spec. TT-T-425 (2) Argentina IRAM 1005 Australia K 51 and 52 Canada I-GP-15 France AFNOR A 31-010 and T 45-001 Germany DIN 55912 Holland NEN 1962:1530 (Methods of test for Titanium Dioxide) India IS 411; IS 1964 2851 Titanium dioxide for the cosmetic industry Pakistan PS111:1960 Spain UNE 1956 48044 (Anatase) Uruguay UNIT 46-50 | Discoverer — John Overton 1870 Literature FDX 355 (PB 74,908) Wurzburgschmidt, <i>FDX</i> 684 (PB 73,758) (a 100 pp. report) Lehmann & Herget, <i>Chem. Z.</i> 51 (1927), 793 Heaton, <i>JSCI</i> , 49 (1930), T 143 Wont & Weber, <i>J. Oil Col. Chem. Asscn.</i> 17 (1934), 257 Tinsley, <i>ibid.</i> 26 (1943), 141 Backhouse, <i>Paint Notes</i> , 3 (6) (1948), 194 O'Brien, <i>Chem. Eng. Progress</i> , 44 (1948), 809 Mansell, <i>Canadian Pt. & Varnish Mag.</i> 22 (1949), 9, 32 Pamphilov & Pelshikhim, <i>Zhurn. prikladn. Khim.</i> 22 (3) (1949), 245 Jacobsen, <i>Ind. Eng. Chem.</i> 41 (1949), 523 Coates, <i>Chem. & Ind.</i> , 25 February 1950 Ray, <i>Verfkroniek</i> , 26 (1951), 46 Wayland & Förland, <i>Ind. Eng. Chem.</i> 42 (1950), 257 Bowman, <i>J. Oil Col. Chem. Asscn.</i> 35 (1952), 314 Radhakrishnan, <i>Proc. Indian Acad. Sci.</i> 35A (1952), 117 Hughes, <i>J. Oil Col. Chem. Asscn.</i> 35 (1952), 535 Taylor, <i>J. Oil Col. Chem. Asscn.</i> 38 (1955), 233 Cromer & Herrington, <i>J. Amer. Chem. Soc.</i> 77 (1955), 4708 Remington & Francis, 50 Thorpe, 11 , 634, 639 (evaluation) The patent literature is most voluminous but it is not known which of the many patents are significant |

77892Titanium sesquioxide Ti_2O_3 Used as a white pigment in corrosion resistant enamels

77893Titanium trioxide or peroxide also known as **Titanellow**, TiO_3

React an aqueous titanate salt with hydrogen peroxide

Used to colour tiles yellow

*Literature*Classen, *Ber.* **21** (1888), 370Billy, *Compt. rend.* **172** (1921), 1411

77894**C.I. Pigment Yellow 118** (*Reddish yellow*) $(\text{Ti}, \text{Ni}, \text{Sb}, \text{Cr})\text{O}_2$

Titanium, Nickel, Antimony, Chromium oxide as a mixed-phase pigment

Chromium Titan Yellow: titanium dioxide with nickel oxide-antimony oxide-chromium oxide approximately corresponding to the above formula

*Solubility*Insoluble in water, acids, ammonia and caustic soda

77901 H_xWO_3 ($x = 0.1-1.0$), $\text{W}_{10}\text{O}_{29}$ is the solitary blue oxide but commercial **Tungsten Blue** is composed of the blue oxide and blue hydroxideAdd excess aqueous ammonium chloride to hot aqueous potassium tungstate, cool, dry the precipitate and heat to redness in a crucible having a porcelain tile to the bottom. When red hot pass hydrogen in for 15 minutes

*Literature*Wells, *Quart. Rev. Chem. Soc.* **3** (1948), 198Glemser & Naumann, *Z. anorg. allg. Chem.* **265** (1951), 288

77903 $\text{K}(\text{or Na})_x\text{WO}_3 \cdot y\text{SnO}_2$

Fuse sodium or potassium tungstate and gradually add tungstic acid until the mass reacts acid, then neutralise with stannic oxide, cool and grind. Depending upon whether sodium or potassium tungstate is used the product is a violet or red pigment having the bronzy lustre of a metal powder

Used as violet or red bronzes

*Literature*Li & Wang, *Tungsten*, New York (1947), 273Wells, *Quart. Rev. Chem. Soc.* **3** (1948), 198Thorpe, **11**, 756Stravmanis, Gupta & Ma, *Z. anorg. allg. Chem.* **265** (1951), 209

77905Tungstic acid hydrate $\text{H}_2\text{WO}_4 \cdot \text{H}_2\text{O}$

(1) Add hydrochloric acid to aqueous sodium tungstate

A yellow compound used for colouring porcelain

*Solubility*Very slightly soluble in water

77915Uranium dioxide UO_2

Extract uranyl nitrate with ether or heat a higher oxide in hydrogen or hydrolyse uranium tetrachloride

This and other uranium compounds are used in ceramics for bright yellows, oranges and reds. It also finds some use as a pigment

77917Uranium trioxide UO_3

Carefully heat uranyl nitrate or ammonium diuranate

Used as a red or yellow pigment, particularly for ceramics

*Solubility*Soluble in acids and alkalis

77919Uranyl uranate U_3O_8

Occurs naturally in pitchblende

As an olive green to grey pigment and in ceramics

77921Uranium peroxide $\text{UO}_4 \cdot 2\text{H}_2\text{O}$

Add hydrogen peroxide to an aqueous uranyl salt

As a yellow pigment and in ceramics

77925Uranium ammonium carbonate $\text{UO}_2\text{CO}_3 \cdot 2(\text{NH}_4)_2\text{CO}_3$ Used to colour ceramic glazes yellow

*Solubility*Soluble in water

77935

Double vanadate of ammonia and copper

Add ammonium vanadate to aqueous copper sulfate (2) and ammonium chloride (1) until the precipitate no longer redissolves on stirring, leave for several hours at 35°C when golden yellow scales settle out, then dry

Use as a red gold bronze **Vanadium Bronze**

77938

Vanadium pentoxide V_2O_5

Roast ammonium vanadate at 500°C first in air and then in oxygen

Used for colouring ceramics, black inks and for rendering glass opaque to ultra violet radiation

Literature

Sons, *Repts. Govt. Ind. Research Inst., Nagoya*, 2 (1953), 63 (Vanadium pigments)

Solubility

Very slightly soluble in water (1.82 g./l.)

77940

Vanadyl sulfate $VO \cdot SO_4$

Reduce a cold solution of vanadium pentoxide in concentrated sulfuric acid with gaseous sulfur dioxide

Used as a blue and green colouriser in glass and ceramics

77945

C.I. Pigment Metal 6

C.I. Pigment Black 16 (*Bluish grey*)

Zinc

Obtained as a grey fine impalpable powder during the distillation of zinc or by crushing zinc at 300°C

Flakes are produced electrolytically followed by lubricating and polishing, they are also produced in Germany by stamping zinc with calcium metal and then heating for at least 24 hr. at 40–50°C to dry and roughen the product

Literature

Evans & Mayne, *Chem. & Ind.* (1944), 109

Grenwood, *Paint*, 19 (1949), 302

Pass, *J. Oil Col. Chem. Ass.* 35 (1952), 241

Blowes et al, *ibid.* 37 (1954), 483

Remington & Francis, 166

Thorpe, 11, 1084

Standards

BS 3982:1966 (Zinc dust pigment)

USA Fed. Spec. TT-Z-291 (2) (Zinc dust); ASTM D520-21; TT-P-460 Zinc dust, dry

77947

C.I. Pigment White 4

Zinc oxide ZnO

(1) **French process** Burn zinc at 300°C

(2) **American process** Burn the naturally occurring $ZnCO_3$, *franklinite* or *zincite*

(3) Add aqueous zinc sulfate to boiling aqueous sodium carbonate, wash the precipitate, dry and heat until all the carbon dioxide is driven off

Leaded zinc oxide consists of a mixture of zinc oxide and basic lead sulfate

Zinc Grey was zinc oxide contaminated with metallic zinc

Discoverer — Coutoise 1751, but first produced commercially in France by Leclair and Sael ca. 1850

Literature

Dupré & Bialus, *Z. angew. Chem.* 16 (1903), 54

Daniels, *J. Oil Col. Chem. Assocn.* 11 (1928), 275

Robertson, *ibid.* 25 (1942), 53

Rischbieth, *ibid.* 33 (1950), 471

Winter & Whitten, *ibid.* 477

Morley-Smith, *ibid.* 484

Jensen, *Mining Mag.* 86 (1952), 15

Anders, *Deut. Farben. Z.* 6 (1952), 175

Kutzelnigg, *Chem. Z.* 76 (1952), 140

Bailey & Pass, *J. Oil Col. Chem. Ass.* 36 (1953), 171

Thorpe, 11, 1089 (zinc oxide), 1091 (leaded zinc oxide)

Standards — Zinc oxide

BS 239, 254:1967

USA ASA K 22-1; Fed. Spec. TT-Z-301 (2); ASTM D79-44;

TT-P-463a Pigment, zinc oxide (dry and paste-in-oil)

Argentina IRAM 1003

Australia K 17 and 18

Belgium NBN 248

Canada 1-GP-11

France T 31-006

Germany DIN 55908/9

Holland NEN 598, 680 and 877

Japan JIS K 5102; K 1410:1962 (Zinc White, zinc oxide)

Hungary MNOSZ 813

India IS 35

Pakistan PS106:1960

Poland PN C 615

Roumania STAS 421

S. Africa SABS 89

Spain UNE 1956 48041

Sweden SIS 16 00 13 and SIS 16 04 02

USSR GOST 10262

Yugoslavia JZS H.C1.020 Inorganic Pigments, Zinc Oxide, technical (Zinc White)

Standards — Leaded zinc oxide

BS 1481 : 1952

USA Fed. Spec. TT-Z-321a; TT-P-462a Pigment, zinc oxide leaded (dry and paste-in-oil)

India IS 36

Pakistan PS107:1960

Solubility

Slightly soluble in water

Reactions

Turns yellow when hot, becoming white again on cooling

77950

Zinc carbonate $ZnCO_3$

Natural occurrence as the mineral *smithsonite*, *calamine*, *white spar*, *franklinite* or *zincite*

Manufacture Precipitate a zinc salt with sodium bicarbonate

Used in U.S.A. as a white pigment and in ceramics

77951Zinc subcarbonate $2\text{ZnCO}_3 \cdot 3\text{Zn(OH)}_2$

Composition of the commercial product varies and it contains zinc oxide as an impurity

Used in U.S.A. as a white pigment

77955 **C.I. Pigment Yellow 36** (*Bright greenish yellow*)
C.I. Pigment Green 16 (component)Zinc chromate—a series of compounds is known in which $\text{ZnO}:\text{CrO}_3$ is 5:1, 4:1, 2:1, 1:1 and 1:2 usually with some water of crystallisation, commercial products all contain some K_2O , the most common commercial Zinc Yellow having the formula $4\text{ZnO} \cdot \text{K}_2\text{O} \cdot 4\text{CrO}_3 \cdot 3\text{H}_2\text{O}$

(1) Stir zinc oxide in a large volume of water, add sulfuric acid to convert most of the zinc to the sulfate and then precipitate with hot aqueous potassium dichromate. Stir for two hours, stand for twenty-four hours, wash, filter and dry

(2) Add hot neutral aqueous zinc sulfate to potassium chromate

(3) Add an aqueous slurry of zinc oxide to boiling potassium dichromate

*Solubility*Slightly soluble in water, readily soluble in nearly all acids, ammonia and caustic soda

Discoverer—Vauquelin 1809, but first produced commercially by James Murdoch in 1847*Literature**J. Oil Col. Chem. Assocn.* **7** (1924), 34, 181; **8** (1925), 90
Ellis, Fox & Hunt, *ibid.* **11** (1928), 194
Briggs, *JCS* (1929), 242
Brizzolaria et al, *Ind. Eng. Chem.* **29** (1937), 656
BIOS 1402, 126
Dowaran & Bose, *J. & Proc. Inst. Chemists* (India), **21** (3) (1949), 91
Maucke, *Farbe u. Lack.* **56** (1950), 446
Scheifle, *Paint, Oil & Col. J.* **126** (1954), 638
Remington & Francis, 113
Thorpe, **9**, 635; **11**, 1095*Standards*BS 389 : 1953; DTD 377A : 1946
USA ASA K 50.1; ASTM D478-49; Fed. Spec. TT-Z-415 (1);
TT-P-465 Zinc Yellow (chromate) dry
Argentina IRAM 1083
Germany DIN 55 902
Holland NEN 1962:1940 (Methods of test for Zinc Chrome);
NEN 1964:1941 (Test methods for Zinc Green)
India IS 51
Ireland I.S.110 (Zinc Chromes for priming paints)
Japan JIS K 5114

77956 **C.I. Pigment Yellow 36:1** (*Dull reddish yellow*)

Basic Zinc Yellow

Zinc tetrahydroxychromate $\text{ZnCrO}_4 \cdot 4\text{Zn(OH)}_2$ Add chromic acid to a zinc oxide slurry

*Standards*BS 389/3: 1963
ASTM D 478-49
USA Fed. Spec. TTP Type I and II
DIN 55902
ISO Draft Recommendation No. 1249 Type II
MIL-C-15328 A*Solubility*Insoluble in water, readily soluble in acids, ammonia and caustic soda

77957Zinc dichromate $\text{ZnCr}_2\text{O}_7 \cdot 3\text{H}_2\text{O}$

Treat zinc hydroxide with chromic acid

Used as an orange-yellow pigment

*Solubility*Soluble in water and acids

77959 **C.I. Pigment Yellow 36** (note)

Co-precipitated calcium and zinc chromates

Precipitate a mixed solution of calcium and zinc chlorides with potassium sodium chromate

77964 **C.I. Pigment White 32** $\text{Zn}_3(\text{PO}_4)_2 \cdot 4\text{H}_2\text{O}$

77965Zinc pyrophosphate $\text{Zn}_2\text{P}_2\text{O}_7$

Heat a soluble zinc salt with ammonium phosphate

Used in U.S.A. as a white pigment

| | | | |
|-------|---|---|--|
| 77975 | C.I. Pigment Black 17 (Grey) C.I. Pigment White 7 | Zinc sulfide $\text{ZnS} \cdot \text{H}_2\text{O}$ | <p><i>Literature</i></p> <p>Pipereant & Vila, <i>Bull. Soc. d'Encour.</i> 111 (1909), 517 Mills, <i>J. Oil Col. Chem. Assocn.</i> 19 (1936), 107 BIOS 814, 65; 1455 and 1574 Stöckmann, <i>Naturwissenschaften</i>, 39 (1952), 226 Krause, <i>Przemysl Chem.</i> 32 (1953), 3 Remington & Francis, 46 Thorpe, 11, 1092 Bersch, 128 (Griffith's Zinc White)</p> <p><i>Standards</i></p> <p>BS 1316 : 1946 (Zinc sulfide type of fluorescent and phosphorescent material); 1014:1961 Zinc sulphide (including lithopones) for cement USA ASTM D477-45 (Zinc sulfide pigments — lithopone) Poland PN C 81015 (Zinc White)</p> |
| 77980 | Zinc titanate ZnTiO_3 | Used as a white pigment | <p><i>Literature</i></p> <p>FDX 540 (PB 70,493)</p> |
| 77990 | C.I. Pigment White 12 Zirconium oxide ZrO_2 | | <p><i>Literature</i></p> <p>GP 262009 Böhm, <i>Chem. Ind.</i> 36, 154 Weiss, <i>Z. anorg. Chem.</i> 65 (1908), 170; GP 235495 Ruff, <i>Z. anorg. Chem.</i> 82 (1923), 373; GP 383323 Sauer, <i>Chem. Z.</i> (1926), 36 Zerr & Rübenkamp, <i>Handbuch der Farben-Fabrikation</i>, 3rd Ed., Dresden (n.d.), 339 Rose, <i>Mineralfarben</i>, 356 Wagner, <i>Die Körperfarben</i>, 162 Wynn, <i>Ind. Chem.</i> 9 (1933), 237 Thorpe, 11, 1115</p> |
| 77995 | Zirconium silicate ZrSiO_4 | <p>Natural occurrence As zircon</p> <p>Manufacture Heat zirconia in a stream of SiF_4 or heat a gelatinous mixture of zirconia and silica under pressure nearly to redness</p> <p>Used as a white pigment in paints and cosmetics</p> | <p><i>Literature</i></p> <p>Deville & Carron, <i>Compt. rend.</i> 46 (1858), 764 Deville, <i>ibid.</i> 52 (1861), 780 Chrystchoff, <i>Jahresber. Miner.</i> (1892) (ii), 232</p> |

NOTES

NOTES

INTERMEDIATES INDEXES

The **Intermediates Index** which commences below lists the compounds referred to in the Preparation columns of this volume. The nomenclature adopted and the arrangement of items are those to be found in the Subject Indexes of *Chemical Abstracts*.

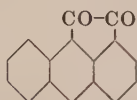
The information given includes the names and structural formulae of the intermediates, the *Colour Index* (Third Edition) numbers of the colouring matters in the manufacture of which they are used, molecular formulae, molecular weights, and, in many cases, melting points and/or boiling points. The lists of *Colour Index* numbers have been arranged in groups to correspond with the various main chemical groups in which the colouring matters are listed. Some numbers have been included which refer to dyes in which the intermediate in question is used indirectly.

In the **Elementary Formula Index** which follows on page 4865 compounds are arranged according to the scheme adopted in the *Chemical Abstracts* Formula Indexes, priority being given to the *Chemical Abstracts* name which is followed by alternative names in common use.

A

1,2-Aceanthredione

$C_{16}H_8O_2$ 71125

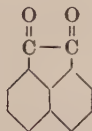


Mol. wt. 232

m.p. 270°

Acenaphthenequinone

$C_{12}H_6O_2$ 73860, 73861, 73870

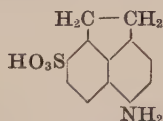


Mol. wt. 182

m.p. 262-263°

3-Acenaphthenesulfonic acid, 6-amino-

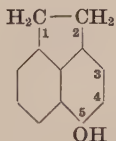
$C_{12}H_{11}NO_3S$ 20200



Mol. wt. 249

5-Acenaphthenol

$C_{12}H_{10}O$ 73855

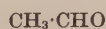


Mol. wt. 170

m.p. 126°

Acetaldehyde

C_2H_4O 46040



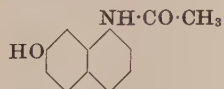
47025

Mol. wt. 44

b.p. 20.8°

Acetamide, *N*-(7-hydroxy-1-naphthyl)-

$C_{12}H_{11}NO_2$ 18160, 18165



Mol. wt. 201

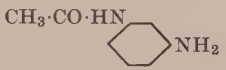

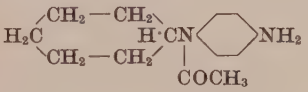
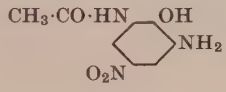
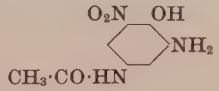
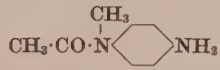
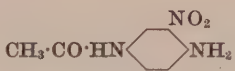
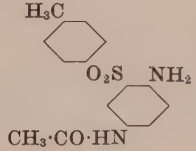
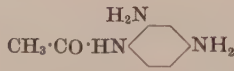
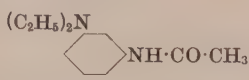
Acetanilide

C_8H_9NO 47025

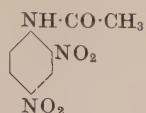


Mol. wt. 135

m.p. 115-116°

| | | |
|---|-----------------------|--|
| Acetanilide, <i>m</i> -amino- | $C_8H_{10}N_2O$ | 13245 |
|  | Mol. wt. 150 | |
| Acetanilide, <i>p</i> -amino- | $C_8H_{10}N_2O$ | 11030, 11855, 14055, 14805, 14895, 14950, 15070, 16130, 16580, 16595, 16600, 17040, 17600, 17755, 18125 |
|  | Mol. wt. 150 | 20000, 21535, 21540, 21545, 21550, 21555, 21580, 21600, 25300, 25325, 27065, 27230, 27700, 27760, 28130, 28500, 29160 |
| | m.p. 162° | 30085, 30395, 31535, 31540, 31545, 31546, 31550, 31555, 31575, 31580, 31585, 31590, 31600, 31605, 31610, 31615, 31620, 31625, 31630, 31635, 31640, 31650, 31660, 31665 |
| | | 35075, 35500, 36000 |
| | | 62125, 62515, 64010 |
| | | 76005 |
| Acetanilide, <i>p</i> -amino- <i>N</i> -cyclohexyl- | $C_{14}H_{20}N_2O$ | 16240, 17990 |
|  | Mol. wt. 232 | |
| Acetanilide, 3'-amino-2'-hydroxy-5'-nitro- | $C_8H_9N_2O_4$ | 11650, 12696 |
|  | Mol. wt. 197 | |
| Acetanilide, 3'-amino-4'-hydroxy-5'-nitro- | $C_8H_9N_2O_4$ | 11650, 15955 |
|  | Mol. wt. 197 | |
| Acetanilide, <i>p</i> -amino- <i>N</i> -methyl- | $C_9H_{12}N_2O$ | 16585 |
|  | Mol. wt. 164 | 62130 |
| Acetanilide, 4'-amino-3'-nitro- | $C_8H_9N_3O_3$ | 17185 |
|  | Mol. wt. 195 | |
| Acetanilide, 4'-amino-3'-(<i>p</i> -tolylsulfonyl)- | $C_{16}H_{16}N_2O_3S$ | 17080 |
|  | Mol. wt. 304 | |
| Acetanilide, 2',4'-diamino- | $C_8H_{11}N_3O$ | 31540 |
|  | Mol. wt. 165 | |
| Acetanilide, <i>m</i> -diethylamino- | $C_{12}H_{18}N_2O$ | 30260 |
|  | Mol. wt. 206 | 42565 |
| | | 46060 |

Acetanilide, 2,4'-dinitro- $C_8H_7N_3O_5$ 53010, 53015



Mol. wt. 225

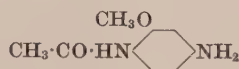
m.p. 121°

Acetanilide, *p*-hydroxy- $C_8H_9NO_2$ 11835, 11836, 11837
14160



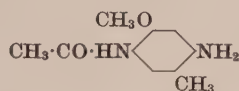
Mol. wt. 151

o-Acetanisidide, 4'-amino- $C_9H_{12}N_2O_2$ 27110



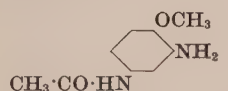
Mol. wt. 180

o-Acetanisidide, 4'-amino-5'-methyl- $C_{10}H_{14}N_2O_2$ 26705



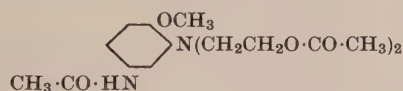
Mol. wt. 194

p-Acetanisidide, 3'-amino- $C_9H_{12}N_2O_2$ 24070



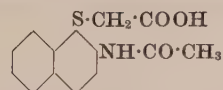
Mol. wt. 180

p-Acetanisidide, 3'-bis(2-acetoxyethyl)amino- $C_{17}H_{24}N_2O_6$ 11340



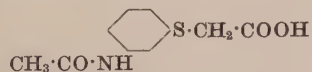
Mol. wt. 352

Acetic acid, (2-acetamido-1-naphthylmercapto)- $C_{14}H_{13}NO_3S$ 73425



Mol. wt. 275

Acetic acid, (*m*-acetamidophenylmercapto)- $C_{10}H_{11}NO_3S$ 73630



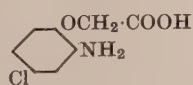
Mol. wt. 225

Acetic acid, (*p*-acetamidophenylmercapto)- $C_{10}H_{11}NO_3S$ 73630



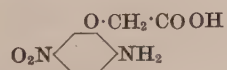
Mol. wt. 225

Acetic acid, (2-amino-4-chlorophenoxy)- $C_8H_8ClNO_3$ 28686



Mol. wt. 201.5

Acetic acid, (2-amino-5-nitrophenoxy)- $C_8H_8N_2O_5$ 25420

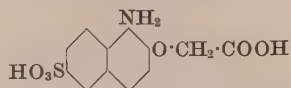


Mol. wt. 212

Acetic acid, (1-amino-6-sulfo-2-naphthyloxy)-

$C_{12}H_{11}NO_6S$

28350

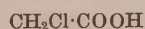


Mol. wt. 297

Acetic acid, chloro-

$C_2H_3ClO_2$

70305, 70306, 70310, 70311
73090



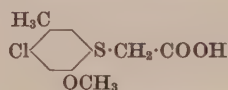
Mol. wt. 94.5

m.p. 61.3°
(two other modifications melt at 56.2° and 52.5° respectively)

Acetic acid,
(4-chloro-6-methoxy-*m*-tolylmercapto)-

$C_{10}H_{11}ClO_3S$

73370

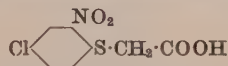


Mol. wt. 246.5

Acetic acid, (4-chloro-2-nitrophenylmercapto)-

$C_8H_6ClNO_4S$

73320

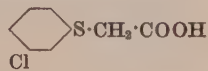


Mol. wt. 247.5

Acetic acid, (*m*-chlorophenylmercapto)-

$C_8H_7ClO_2S$

73305

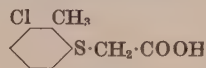


Mol. wt. 202.5

Acetic acid, (3-chloro-*o*-tolylmercapto)-

$C_9H_9ClO_2S$

73380

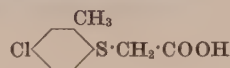


Mol. wt. 216.5

Acetic acid, (4-chloro-*o*-tolylmercapto)-

$C_9H_9ClO_2S$

73385



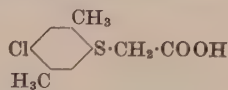
Mol. wt. 216.5

m.p. 128-129°

Acetic acid, (4-chloro-2,5-xylylmercapto)-

$C_{10}H_{11}ClO_2S$

73395

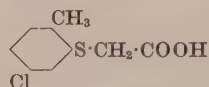


Mol. wt. 230.5

Acetic acid, (5-chloro-*o*-tolylmercapto)-

$C_9H_9ClO_2S$

73390



Mol. wt. 216.5

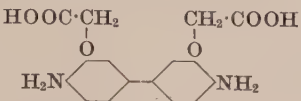
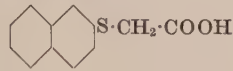
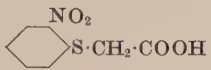

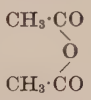
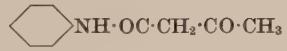
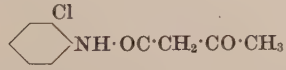
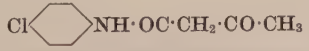
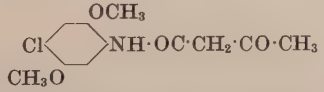
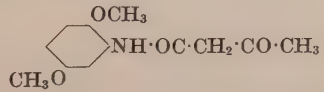
Acetic acid, cyano-, butyl ester

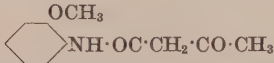

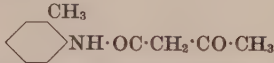
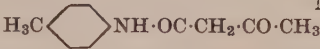
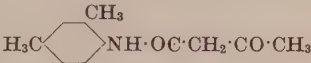
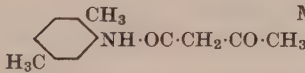
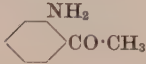


$C_7H_{11}NO_2$

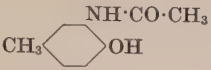
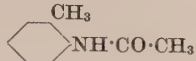
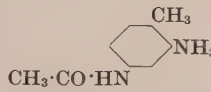
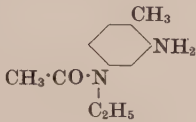
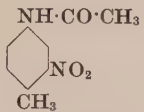
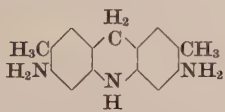
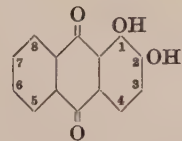
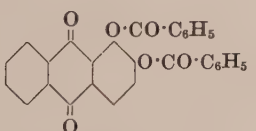
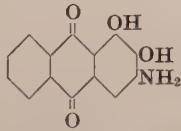
48001



Mol. wt. 141

| | | |
|---|----------------------|--|
| Acetic acid, cyano-, ethyl ester | $C_5H_7NO_2$ | 48000, 48005 |
| $NC \cdot CH_2 \cdot COOC_2H_5$ | Mol. wt. 113 | |
| | b.p. 207° | |
| Acetic acid, (4,4'-diamino-3,3'-biphenylenedioxy)di- | $C_{16}H_{16}N_2O_6$ | 24550, 24555, 24560, 24565 |
| $HOOC \cdot CH_2$ $CH_2 \cdot COOH$  | Mol. wt. 236 | |
| Acetic acid, mercapto- | $C_2H_4O_2S$ | |
| $HS \cdot CH_2 \cdot COOH$ | Mol. wt. 92 | 73685 |
| Acetic acid, (2-naphthylmercapto)- | $C_{12}H_{10}O_2S$ | 73410 |
|  | Mol. wt. 218 | |
| | m.p. 76° | |
| Acetic acid, (o-nitrophenylmercapto)- | $C_8H_7NO_4S$ | 73315 |
|  | Mol. wt. 213 | |
| Acetic acid, terephthaloyldi-, diethyl ester | $C_{16}H_{18}O_6$ | 37615, 37620 |
| $C_2H_5O \cdot OC \cdot CH_2 \cdot OC$  $CO \cdot CH_2 \cdot CO \cdot OC_2H_5$ | Mol. wt. 306 | |
| Acetic anhydride | $C_4H_6O_3$ | 45555, 47025 |
| $CH_3 \cdot CO$  | Mol. wt. 102 | 48070, 48075, 48080 |
| | b.p. 139.5° | |
| Acetoacetanilide | $C_{10}H_{11}NO_2$ | 11660, 11665, 11670, 11680, 11690, 11700, 13890, 13900, 13901, 13920, 13925, 13930 |
|  | Mol. wt. 177 | 21090, 21130, 21160, 23250, 23255, 23900, 25345, 26060 |
| | m.p. 85° | 60600 |
| Acetoacetanilide, o-chloro- | $C_{10}H_{10}ClNO_2$ | 11710, 21091 |
|  | Mol. wt. 211.5 | |
| Acetoacetanilide, p-chloro- | $C_{10}H_{10}ClNO_2$ | 60605 |
|  | Mol. wt. 211.5 | |
| Acetoacetanilide, 4-chloro-2,5-dimethoxy- | $C_{12}H_{14}ClNO_4$ | 11760, 11765 |
|  | Mol. wt. 271.5 | 37613, 60616 |
| Acetoacetanilide, 2,5-dimethoxy- | $C_{12}H_{15}NO_4$ | 11750 |
|  | Mol. wt. 237 | |

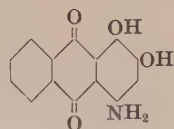
| | | |
|---|--------------------|---|
| <i>o</i>-Acetoacetanisidide | $C_{11}H_{13}NO_3$ | 11738, 11740, 11741, 13950 21105, 22770, 25350 |
|  | Mol. wt. 207 | |
| Acetoacetic acid, ethyl ester | $C_6H_{10}O_3$ | 23005 37610, 37625 55015 |
| $CH_3 \cdot CO \cdot CH_2 \cdot CO \cdot OC_2H_5$ | Mol. wt. 130 | |
| | b.p. 181° | |
| <i>p</i>-Acetoacetophenetidide | $C_{12}H_{15}NO_3$ | 11770 |
|  | Mol. wt. 221 | |
| <i>o</i>-Acetoacetotoluidide | $C_{11}H_{13}NO_2$ | 11720, 11725 21095, 21135 |
|  | Mol. wt. 191 | |
| <i>p</i>-Acetoacetotoluidide | $C_{11}H_{13}NO_2$ | 21096 |
|  | Mol. wt. 191 | |
| 2,4-Acetoacetoxylidide | $C_{12}H_{15}NO_2$ | 11730, 11735 21100, 21165, 21220 |
|  | Mol. wt. 205 | |
| 2,5-Acetoacetoxylidide | $C_{12}H_{15}NO_2$ | 37611 |
|  | Mol. wt. 205 | |
| Acetone | C_3H_6O | 73025, 73085, 73090 |
| $CH_3 \cdot CO \cdot CH_3$ | Mol. wt. 58 | |
| | b.p. 56° | |
| Acetone, acetyl- | | |
| <i>See</i> 2,4-Pentanedione | | |
| Acetophenone, <i>o</i>-amino- | C_8H_9NO | 47025 |
|  | Mol. wt. 135 | |
| | b.p. 250–252° | |
| Acetophenone, <i>p</i>-amino- | C_8H_9NO | 47025 |
|  | Mol. wt. 135 | |
| | m.p. 110° | |
| <i>m</i>-Acetotoluidide, 4-amino- | $C_9H_{12}N_2O$ | 16620, 16625 |
|  | Mol. wt. 164 | |

| | | |
|---|--|---|
| <i>m</i>-Acetotoluidide, 6'-hydroxy- | $C_9H_{11}NO_2$ | 11880 |
|  | Mol. wt. 165 | |
| <i>o</i>-Acetotoluidide | $C_9H_{11}NO$ | 53150 |
|  | Mol. wt. 149 | |
| | m.p. 110° | |
| <i>p</i>-Acetotoluidide, 3'-amino- | $C_9H_{12}N_2O$ | 16630 24065 |
|  | Mol. wt. 164 | |
| <i>p</i>-Acetotoluidide, 3'-amino-<i>N</i>-ethyl- | $C_{11}H_{16}N_2O$ | 17640, 18915 |
|  | Mol. wt. 192 | |
| <i>p</i>-Acetotoluidide, 3'-nitro- | $C_9H_{10}N_2O_3$ | 53145 |
|  | Mol. wt. 194 | |
| | m.p. 96° | |
| Acridan, 3,6-diamino-2,7-dimethyl- | $C_{15}H_{17}N_3$ | 53680 |
|  | Mol. wt. 239 | |
| Acridone, 9,12-dichlorophthaloyl- | <i>See</i> Naphth[2,3- <i>c</i>]acridan-5,8,14-trione, 9,12-dichloro- | |
| Alizarin | $C_{14}H_8O_4$ | 58005, 58010, 58015, 58020, 58205, 58215, 58230, 58500, 60875 |
|  | Mol. wt. 240 | |
| | m.p. 290° | |
| Alizarin, dibenzoate | $C_{28}H_{16}O_6$ | 58020 |
|  | Mol. wt. 448 | |
| | m.p. 187° | |
| Alizarin, 3-amino- | $C_{14}H_9NO_4$ | 67410, 67415, 67420, 67435, 67440, 67445, 67450 |
|  | Mol. wt. 255 | |
| | m.p. > 300° | |

Alizarin, 4-amino-

$C_{14}H_9NO_4$

67405

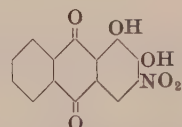


Mol. wt. 255

Alizarin, 3-nitro-

$C_{14}H_7NO_6$

67410, 67415, 67420, 67435, 67440, 67445, 67450



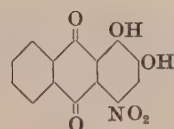
Mol. wt. 285

m.p. 244°

Alizarin, 4-nitro-

$C_{14}H_7NO_6$

60765



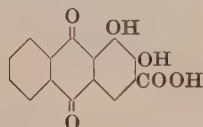
Mol. wt. 285

m.p. 289°
(decomp.)

3-Alizarincarboxylic acid

$C_{15}H_8O_8$

58220

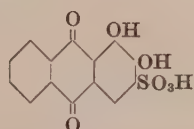


Mol. wt. 284

3-Alizarinsulfonic acid

$C_{14}H_8O_7S$

58210

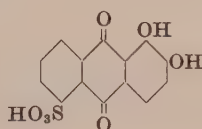


Mol. wt. 320

5-Alizarinsulfonic acid

$C_{14}H_8O_7S$

58230



Mol. wt. 320

Alloxantin

See 5,5'-Bibarbitoric acid, 5,5'-dihydroxy-

p-Aminodiphenyl

See 4-Biphenylamine

o-Aminothiophenol

See Benzenethiol, *o*-amino-

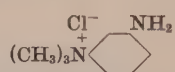
Ammonium chloride,
(*m*-aminophenyl)trimethyl-

$C_9H_{15}ClN_2$

11935

20025, 26000, 26060, 26115, 26140

33500, 33505

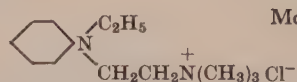


Mol. wt. 186.5

Ammonium chloride, [2-(*N*-ethylanilino)-
ethyl]trimethyl-

$C_{13}H_{23}NCl$

11085



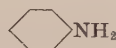
Mol. wt. 228

Amylamine $\text{C}_5\text{H}_{13}\text{N}$

61555

Mol. wt. 87

b.p. 104°

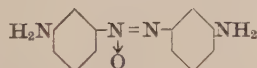
Aniline $\text{C}_6\text{H}_7\text{N}$

Mol. wt. 93

b.p. 184·4°

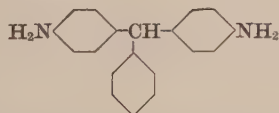
See also Aniline, *p*-phenylazo-; Benzenesulfonic acid, *p*-(*p*-aminophenylazo)-; Methanesulfonic acid, anilino-

10335, 10338, 10340, 10348, 10360
 11000, 11005, 11020, 11021, 11129, 11270, 11320, 11350, 11380,
 11800, 11840, 11850, 11950, 12000, 12055, 12700, 12770,
 13010, 13440, 13990, 14800, 15800, 15970, 16100, 16230,
 16530, 16570, 17150, 17160, 17200, 17770, 17780, 17840,
 18100, 18820, 18890, 18960, 19130, 19180, 19200, 19560
 20010, 20018, 20030, 20070, 20075, 20160, 20216, 20340, 20370,
 20375, 20380, 20390, 20410, 20425, 20460, 20470, 20475,
 20490, 20495, 20496, 20500, 20520, 20530, 26040, 26080,
 26150, 26380, 26410, 26545, 26720, 27130, 27220, 27530,
 27680, 27710, 28125, 28165, 28300, 28395, 28650, 28660,
 28680, 29100, 29150, 29155, 29156, 29160, 29165
 30095, 30210, 30235, 30240, 30245, 30250, 30255, 30270, 30280,
 30334, 33500, 33505, 33540, 34040, 34045, 34100, 34145,
 34170
 40621, 40622
 42500, 42510, 42634, 42760, 42775, 43545
 45185, 45186
 47025
 49400
 50055, 50200, 50204, 50205, 50206, 50221, 50225, 50235, 50245,
 50250, 50370, 50400, 50415, 50430, 50440
 51070, 51120, 51125, 51135, 51160, 51210, 51210
 52000
 53040
 56000, 56010, 56011, 56012, 56055
 57020
 59050, 59051, 60510, 61900, 61110, 61515, 62055, 62060, 62065,
 62520, 63300, 63335, 63615, 63620, 67900, 67905, 67915,
 68200, 68205, 68415
 76000

Aniline, 3,3'-azoxydi- $\text{C}_{12}\text{H}_{12}\text{N}_4\text{O}$

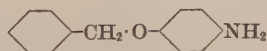
25000, 25005

Mol. wt. 228

Aniline, 4,4'-benzylidenedi- $\text{C}_{10}\text{H}_{18}\text{N}_2$

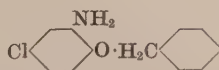
24820, 24825

Mol. wt. 274

Aniline, *p*-benzyloxy- $\text{C}_{13}\text{H}_{18}\text{NO}$

56060

Mol. wt. 199

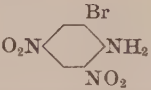

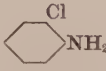

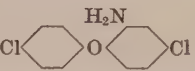
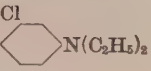
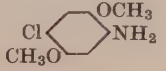
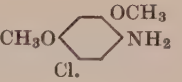
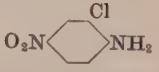
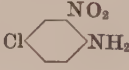
Aniline, 2-benzyloxy-5-chloro- $\text{C}_{13}\text{H}_{12}\text{ClNO}$

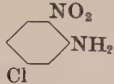
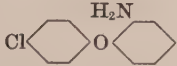
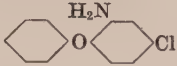
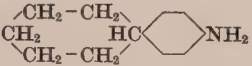
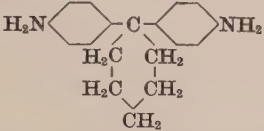
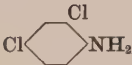
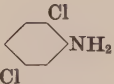
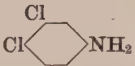


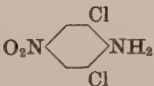
18135

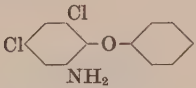
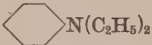

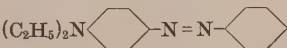
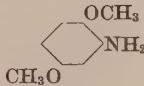
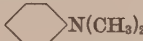
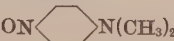

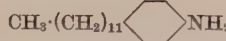

Mol. wt. 233·5

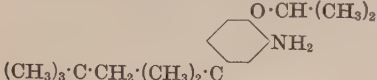
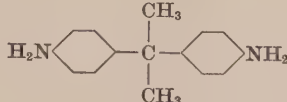



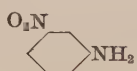


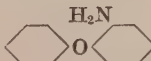
Aniline, 3,5-bis(trifluoromethyl)-

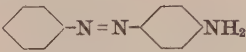
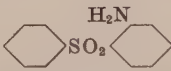
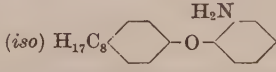
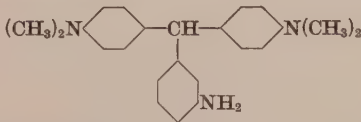

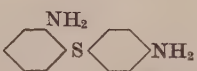

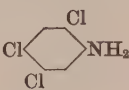
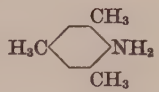
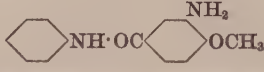
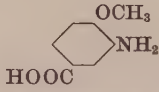
See 3,5-Xylidine, $\alpha,\alpha,\alpha',\alpha',\alpha',\alpha'$ -hexafluoro-

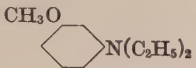
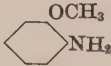
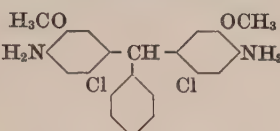
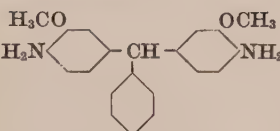
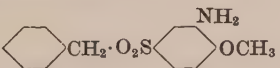
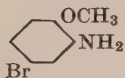
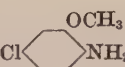
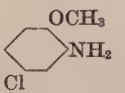
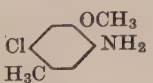
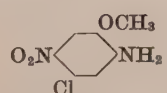
| | | |
|---|-------------------------|--|
| Aniline, 2-bromo-4,6-dinitro- | <chem>C6H4BrN3O4</chem> | 11200, 11205, 11410, 11420 |
|  | Mol. wt. 262 | |
| Aniline, <i>m</i>-chloro- | <chem>C6H6ClN</chem> | 12305, 12810, 18020, 18030 |
|  | Mol. wt. 127.5 | 25100 37511 52100 68220 |
| | b.p. 236° | |
| Aniline, <i>o</i>-chloro- | <chem>C6H6ClN</chem> | 12300, 12705, 12750, 15990, 19025, 19110, 19210, 19220 |
|  | Mol. wt. 127.5 | 20410, 20415, 20420 30285 37060 42505, 47015 |
| | b.p. 209° | |
| Aniline, <i>p</i>-chloro- | <chem>C6H6ClN</chem> | 10336, 12775, 15995 |
|  | Mol. wt. 127.5 | 37510, 37610 47010 56005, 56015, 56016, 56017, 56050, 56065 71135 |
| | m.p. 70° b.p. 231° | |
| Aniline, 5-chloro-2-(<i>p</i>-chlorophenoxy)- | <chem>C12H9Cl2NO</chem> | 37075 |
|  | Mol. wt. 254 | |
| Aniline, <i>m</i>-chloro-<i>N,N</i>-diethyl- | <chem>C10H14ClN</chem> | 42605 |
|  | Mol. wt. 183.5 | |
| | b.p. 248–249° | |
| Aniline, 4-chloro-2,5-dimethoxy- | <chem>C8H10ClNO2</chem> | 37555, 37569 |
|  | Mol. wt. 187.5 | |
| Aniline, 5-chloro-2,4-dimethoxy- | <chem>C8H10ClNO2</chem> | 37550, 37615 |
|  | Mol. wt. 187.5 | |
| Aniline, 2-chloro-4-nitro- | <chem>C6H5ClN2O2</chem> | 11035, 11085, 11115, 11125, 11215, 11430, 12085, 14040 |
|  | Mol. wt. 172.5 | 30300, 30320 37200 |
| Aniline, 4-chloro-2-nitro- | <chem>C6H5ClN2O2</chem> | 10325 |
|  | Mol. wt. 172.5 | 11670, 11710, 11730, 11738, 11770, 12090, 12380, 12465 37040 |
| | m.p. 115° | |

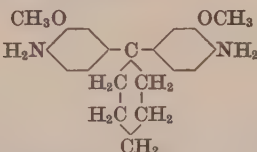
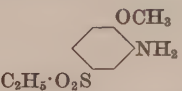
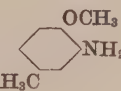
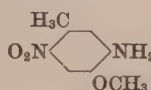
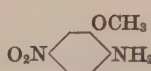
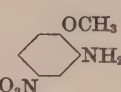
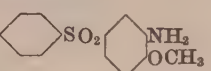
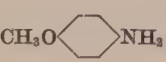
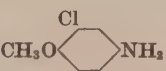
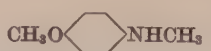
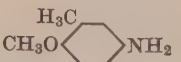
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| Aniline, 5-chloro-2-nitro- | $C_6H_5ClN_2O_2$ | 10330 12080 |
|  | Mol. wt. 172.5 m.p. 124–125° | |
| Aniline, o-(p-chlorophenoxy)- | $C_{12}H_{10}ClNO$ | 37070 |
|  | Mol. wt. 219.5 | |
| Aniline, 5-chloro-2-phenoxy- | $C_{12}H_{10}ClNO$ | 18134 20435 |
|  | Mol. wt. 219.5 | |
| Aniline, p-cyclohexyl- | $C_{12}H_{17}N$ | 18035 61590 |
|  | Mol. wt. 175 m.p. 54–56° | |
| Aniline, 4,4'-cyclohexylidenedi- | $C_{18}H_{22}N_2$ | 24780, 24785, 24790 |
|  | Mol. wt. 266 | |
| Aniline, 2,4-dichloro- | $C_6H_5Cl_2N$ | 12815 20040 |
|  | Mol. wt. 162 | |
| Aniline, 2,5-dichloro- | $C_6H_5Cl_2N$ | 12310, 12440, 12460, 12470, 12480, 12710, 13155, 17180 20430, 20435, 20440 30265, 30290, 30330, 30340, 30350 37010 67815 |
|  | Mol. wt. 162 m.p. 50° | |
| Aniline, 3,4-dichloro- | $C_6H_5Cl_2N$ | 16100 |
|  | Mol. wt. 162 | |
| Aniline, 4,4'-(dichloromethylene)bis[N,N-diethyl-] | $C_{21}H_{28}Cl_2N_2$ | 44085 |
|  | Mol. wt. 379 | |
| Aniline, 4,4'-(dichloromethylene)bis[N,N-dimethyl-] | $C_{17}H_{20}Cl_2N_2$ | 42563, 43520, 44040, 44045, 44055, 44090 |
|  | Mol. wt. 323 | |
| Aniline, 2,6-dichloro-4-nitro- | $C_6H_4Cl_2N_2O_2$ | 11100, 11152, 11190, 11340 37195 |
|  | Mol. wt. 207 | |

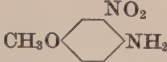
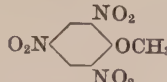
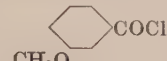


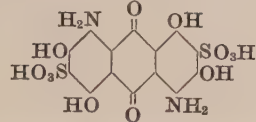
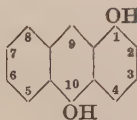

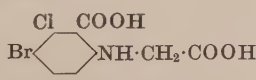
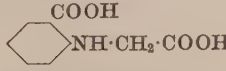
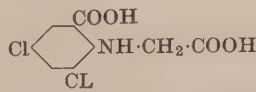
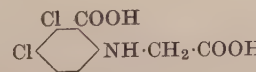
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| Aniline, 3,5-dichloro-2-phenoxy- | $C_{12}H_8Cl_2NO$ | 67810 |
|  | Mol. wt. 254 | |
| Aniline, <i>N,N</i>-diethyl- | $C_{10}H_{15}N$ | 11021, 11060, 11070 26200 |
|  | Mol. wt. 149 | 42040, 42045, 42046, 42047, 42050, 42051, 42600, 42650, 42666, 42680 |
| | b.p. 216.5° | 50225 52025 |
| Aniline, <i>N,N</i>-diethyl-<i>p</i>-nitroso- | $C_{10}H_{14}N_2O$ | 50035, 50165, 50216, 50306, 50310 51050, 51065, 51080, 51110 |
|  | Mol. wt. 178 | |
| | m.p. 85° | |
| Aniline, <i>N,N</i>-diethyl-<i>p</i>-phenylazo- | $C_{16}H_{18}N_2$ | 51050 |
|  | Mol. wt. 253 | |
| Aniline, 2,5-dimethoxy- | $C_8H_{11}NO_2$ | 11260, 12156 35775, 35810 37190, 37195 48055 |
|  | Mol. wt. 153 | |
| Aniline, <i>N,N</i>-dimethyl- | $C_8H_{11}N$ | 11020, 11025, 11035, 11040, 11045, 11050, 13020, 13025, 13030 42000, 42020, 42021, 42025, 42030, 42038, 42060, 42535, 42555, 42615, 42620, 43510 |
|  | Mol. wt. 121 | 49405 52002, 52015 |
| | b.p. 193° | |
| Aniline, <i>N,N</i>-dimethyl-<i>p</i>-nitroso- | $C_8H_{10}N_2O$ | 43510 49405, 49410 49700 |
|  | Mol. wt. 150 | 50030, 50035, 50040, 50150, 50155, 50160, 50205, 50215, 50220, 50221, 50255, 50260, 50265, 50270, 50300, 50305, 50425, 50430, 50431 |
| | m.p. 92° | 51000, 51015, 51020, 51025, 51030, 51040, 51045, 51065, 51080, 51110, 51175, 51190, 51205, 51215 |
| Hydrochloride | Mol. wt. 186.5 | |
| | m.p. ~ 177° | |
| Aniline, 2,4-dinitro- | $C_6H_5N_3O_4$ | 11015, 11060, 11120, 11195, 12075, 13040, 13050, 13140, 13160, 13180, 14890 |
|  | Mol. wt. 183 | |
| | m.p. 176° | |
| Aniline, <i>p</i>-dodecyl- | $C_{18}H_{31}N$ | 18073, 18961 62075 |
|  | Mol. wt. 261 | |
| Aniline, <i>o</i>-ethyl- | $C_8H_{11}N$ | 37112 |
|  | Mol. wt. 121 | |

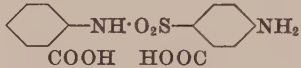
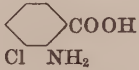
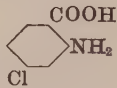
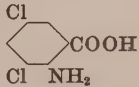
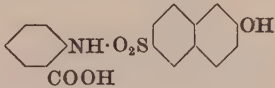
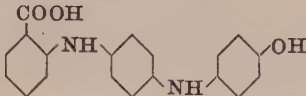
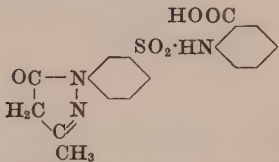
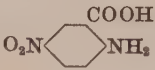
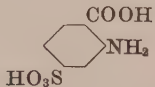
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|---|---------------------------------------|---|
| Aniline, 2-isopropoxy-5-(1,1,3,3-tetramethylbutyl)- | $C_{17}H_{29}NO$ | 18150 |
|  | Mol. wt. 263 | |
| Aniline, 4,4'-isopropylidenedi- | $C_{15}H_{18}N_2$ | 61135 |
|  | Mol. wt. 226 m.p. 83° | |
| Aniline, 4,4'-methylenebis[N,N-diethyl-] | $C_{21}H_{30}N_2$ | 41001, 44080 |
|  | Mol. wt. 310 | |
| Aniline, 4,4'-methylenebis[N,N-dimethyl-] | $C_{17}H_{22}N_2$ | 41000, 45006, 46005 |
|  | Mol. wt. 254 m.p. 91° b.p. 390° | |
| Aniline, 4,4'-methylenedi- | $C_{13}H_{14}N_2$ | 24750 42500 |
|  | Mol. wt. 198 m.p. 88-89° | |
| Aniline, m-nitro- | $C_6H_6N_2O_2$ | 12065, 12790, 13145, 14025, 14195, 14320, 16120, 18105 20025, 20385, 20460, 25000 35080, 36020, 37030, 37515 46050 53115 |
|  | Mol. wt. 138 m.p. 114° | |
| Aniline, o-nitro- | $C_6H_6N_2O_2$ | 11660, 12060, 12780, 12795 20450 30310 37025 71100, 71105, 71110 |
|  | Mol. wt. 138 m.p. 71.5° | |
| Aniline, p-nitro- | $C_6H_6N_2O_2$ | 11005, 11025, 11080, 11110, 11150, 11180, 11210, 11230, 11240, 11250, 11255, 11260, 11310, 11365, 11385, 11665, 11955, 12070, 12071, 12795, 13030, 13055, 13170, 13175, 13355, 13365, 13370, 14030, 14045, 14155, 14325, 16545, 16575, 16580, 18115, 18120, 19520, 19530 20000, 20150, 20151, 20345, 20390, 20391, 20470, 20475, 20480, 20485, 20495, 20496, 20520, 20540, 21570, 21571, 21575, 21590, 25010, 25215, 25220, 25225, 25300, 25310, 25315, 25320, 26545, 27700, 27715, 28710, 29000, 29005, 29010 30000, 30005, 30010, 30015, 30020, 30025, 30225, 30230, 30295, 30315, 30345, 31560, 31565, 31570, 31595, 31645, 31655, 32035, 32040, 33520, 33525, 33545, 34040, 34045, 34905 34960 34907, 35025, 35030, 35085, 35200, 35255, 35260, 35265, 35270, 35275, 35295, 35315, 36020 37035 53037, 53065, 53066, 53075 |
|  | Mol. wt. 138 m.p. 148° | |
| Aniline, 2-nitro-4-trifluoromethyl- | | |
| <i>See p-Toluidine, α,α,α-trifluoro-2-nitro-</i> | | |
| Aniline, o-phenoxy- | $C_{12}H_{11}NO$ | 20385, 20430, 20485 |
|  | Mol. wt. 185 | |



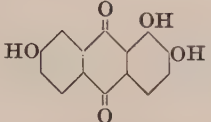
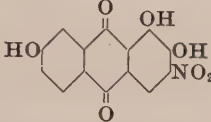
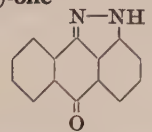
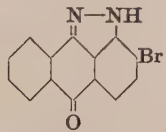
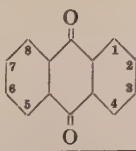
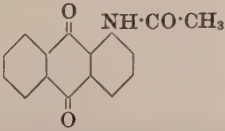
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|---|---------------------------|---|
| Aniline, <i>p</i>-phenylazo- | $C_{12}H_{11}N_3$ | 13015, 13100 26020, 26050, 26070, 26090, 26100, 26207, 26660, 26760, 26780, 27150, 27190, 27290, 27291, 27305, 27306, 27500, 27560, 28100, 28390 33545 50400, 50411, 50435 |
|  | Mol. wt. 197 m.p. 127° | |
| Aniline, <i>o</i>-(phenylsulfonyl)- | $C_{12}H_{11}NO_2S$ | 17070 37060 |
|  | Mol. wt. 233 | |
| Aniline, <i>o</i>-[<i>p</i>-(1,1,3,3-tetramethylbutyl)phenoxy]- | $C_{20}H_{27}NO$ | 18910 |
|  | Mol. wt. 297 | |
| Aniline, <i>N,N,N',N'</i>-tetramethyl-3,4',4''-methylidynetri- | $C_{23}H_{27}N_3$ | 42175 |
|  | Mol. wt. 345 | |
| Aniline, <i>p</i>-thiocyanato- | $C_7H_6N_2S$ | 19030 |
|  | Mol. wt. 150 | |
| Aniline, 2,4'-thiodi- | $C_{12}H_{12}N_2S$ | 25100 |
|  | Mol. wt. 216 | |
| Aniline, 4,4'-thiodi- | $C_{12}H_{12}N_2S$ | 25100, 25110, 25115 |
|  | Mol. wt. 216 | |
| Aniline, 2,4,5-trichloro- | $C_6H_4Cl_3N$ | 11760, 12370 |
|  | Mol. wt. 196.5 | |
| Aniline, 2,4,6-trimethyl- | $C_9H_{13}N$ | 45200 |
|  | Mol. wt. 135 b.p. 230° | |
| Anilinedisulfonic acid, dibenzyl- | | |
| <i>See</i> Toluenesulfonic acid, α,α' -phenyliminodi- | | |
| Aniline-<i>m</i>-sulfonic acid | | |
| <i>See</i> Metanilic acid | | |
| <i>p</i>-Anisanilide, 3-amino- | $C_{14}H_{14}N_2O_2$ | 12320, 12360, 12825 |
|  | Mol. wt. 242 | |
| <i>p</i>-Anisic acid, 3-amino- | $C_8H_9NO_3$ | 14715 |
|  | Mol. wt. 167 | |

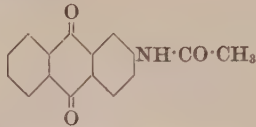
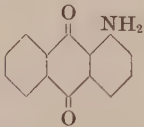
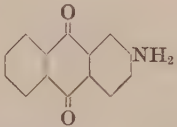
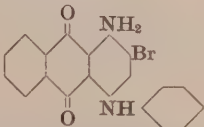
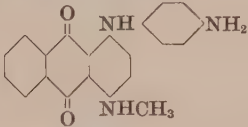
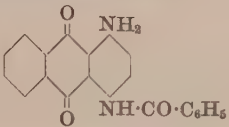
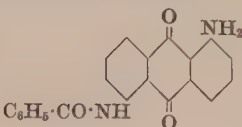
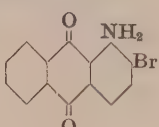
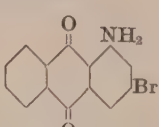
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| m-Anisidine, N,N-diethyl- | $C_{11}H_{17}NO$ | 51004 |
|  | Mol. wt. 179 | |
| o-Anisidine | C_7H_9NO | 11245, 12150, 13200, 14070, 14710, 14905, 14955, 15015, 16030, 16151, 16700, 17570, 17820, 17845, 17860, 17875, 18025, 18040, 18075, 18133, 19505, 19580 |
|  | Mol. wt. 123 | 26570, 27180, 27780, 28190, 29000, 29035, 29045, 29170, 29185, 29190, 29195, 29200, 29205 |
| | b.p. 218° | 31951 37115, 37530, 37566 50050 |
| o-Anisidine, 4,4'-benzylidenebis[5-chloro- | $C_{21}H_{20}Cl_2N_2O_2$ | 24840 |
|  | Mol. wt. 403 | |
| o-Anisidine, 4,4'-benzylidenedi- | $C_{21}H_{22}N_2O_2$ | 21260 |
|  | Mol. wt. 334 | |
| o-Anisidine, 5-(benzylsulfonyl)- | $C_{14}H_{15}NO_3S$ | 12455 37145 |
|  | Mol. wt. 277 | |
| o-Anisidine, 5-bromo- | C_7H_8BrNO | 37532 |
|  | Mol. wt. 202 | |
| o-Anisidine, 4-chloro- | C_7H_8ClNO | 17905 37531 |
|  | | |
| o-Anisidine, 5-chloro- | C_7H_8ClNO | 13165, 14960, 14980, 16055, 16260 37120 |
|  | Mol. wt. 157.5 | |
| o-Anisidine, 4-chloro-5-methyl- | $C_8H_{10}ClNO$ | 37541, 37620 |
|  | Mol. wt. 171.5 | |
| o-Anisidine, 5-chloro-4-nitro- | $C_7H_7ClN_2O_3$ | 15025 |
|  | Mol. wt. 202.5 | |

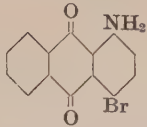
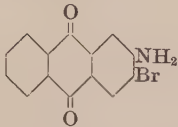
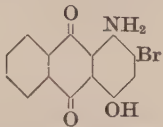
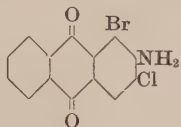
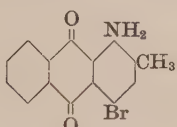
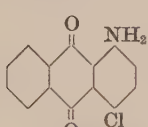
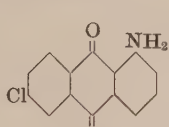
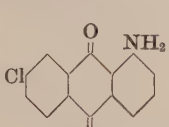
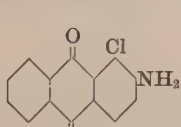
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|---|----------------------|---|
| o-Anisidine, 4,4'-cyclohexylidenedi- | $C_{20}H_{26}N_2O_2$ | 24810 |
|  | Mol. wt. 326 | |
| o-Anisidine, 5-(ethylsulfonyl)- | $C_9H_{13}NO_3S$ | 37140 |
|  | Mol. wt. 215 | |
| o-Anisidine, 5-methyl- | $C_8H_{11}NO$ | 11250, 11255, 12155, 13210, 14940, 14965, 15060, 16160 |
|  | Mol. wt. 137 | 24075, 26565, 26680, 27050, 27140, 27625, 27700, 27770, 27880, 27885, 27890, 27895, 27900, 27905, 27910, 27915, 27920, 27925, 27980, 28200, 28270, 28500, 29005, 29010, 29050, 29055, 29060, 29065, 29080, 29085, 29090 |
| | | 31595, 31640, 31645, 31825, 31845, 33560, 34010, 34020, 34040, 34045 |
| | | 35420, 35770 |
| | | 37136 |
| o-Anisidine, 5-methyl-4-nitro- | $C_8H_{10}N_2O_3$ | 21630 |
|  | Mol. wt. 182 | 31675 |
| o-Anisidine, 4-nitro- | $C_7H_8N_2O_3$ | 11040, 11070, 11741, 11220, 12400, 12500, 17580 |
|  | Mol. wt. 168 | 25040 |
| | | 36250 |
| | | 37125 |
| o-Anisidine, 5-nitro- | $C_7H_8N_2O_3$ | 12160, 12355, 17605 |
|  | Mol. wt. 168 | 37130 |
| o-Anisidine, 5-(phenylsulfonyl)- | $C_{13}H_{13}NO_3S$ | 12450 |
|  | Mol. wt. 263 | |
| p-Anisidine | C_7H_9NO | 10350 |
|  | Mol. wt. 123 | 17845, 17860 |
| | | 37535, 37595 |
| | | 26715 |
| | | 71140 |
| | m.p. 57° | |
| p-Anisidine, 3-chloro- | C_7H_8ClNO | 16165 |
|  | Mol. wt. 157.5 | |
| p-Anisidine, N-methyl- | $C_8H_{11}NO$ | 44515 |
|  | Mol. wt. 137 | |
| p-Anisidine, 3-methyl- | $C_8H_{11}NO$ | 37540 |
|  | Mol. wt. 137 | |

| | | | |
|---|---|--|--|
| <i>p</i>-Anisidine, 2-nitro- |  | $C_7H_8N_2O_3$ Mol. wt. 168 | 11690, 11725, 12405, 12505 |
| Anisole, 2,4,6-trinitro- |  | $C_7H_5N_3O_7$ Mol. wt. 243 m.p. 65° | 10430, 10435, 10440 |
| <i>m</i>-Anisoyl chloride |  | $C_8H_7ClO_2$ Mol. wt. 170.5 b.p. 242-243°/733 mm. | 61655 |
| <i>p</i>-Anisoyl chloride |  | $C_8H_7ClO_2$ Mol. wt. 170.5 m.p. 22° | 63365 |
| Anthanthrone | <i>See</i> Dibenzo[<i>cd,jk</i>]pyrene-6,12-dione | | |
| Anthracene |  | $C_{14}H_{10}$ Mol. wt. 178 m.p. 216° | 58825, 58830 |
| 2,6-Anthrachrysonedisulfonic acid, 4,8-diamino- |  | $C_{14}H_{10}N_2O_{12}S_2$ Mol. wt. 462 | 58610 |
| 1,10-Anthradiol |  | $C_{14}H_{10}O_2$ Mol. wt. 210 | 73825 |
| Anthranilic acid |  | $C_7H_7NO_2$ Mol. wt. 137 m.p. 145° | 13020, 13058, 13430, 13995, 14210, 14670, 15500, 15975, 16105, 16315, 17590, 18690, 18821, 19060 20320, 26540, 29166, 29167 34960 61720, 68700 73000 |
| Anthranilic acid, 5-bromo-<i>N</i>-(carboxymethyl)-6-chloro-, dimethyl ester |  | $C_9H_7BrClNO_4$ Mol. wt. 308.5 | 73045 |
| Anthranilic acid, <i>N</i>-(carboxymethyl)- |  | $C_9H_9NO_4$ Mol. wt. 195 m.p. 207° | 73000 |
| Anthranilic acid, <i>N</i>-(carboxymethyl)-3,5-dichloro- |  | $C_9H_7Cl_2NO_4$ Mol. wt. 264 | 73040 |
| Anthranilic acid, <i>N</i>-(carboxymethyl)-5,6-dichloro- |  | $C_9H_7Cl_2NO_4$ Mol. wt. 264 | 73035 |

| | | |
|---|-----------------------|--------------------------------|
| Anthranilic acid, <i>N</i> -(2-carboxysulfanilyl)- | $C_{14}H_{12}N_2O_6S$ | 18710 |
|  | Mol. wt. 336 | |
| Anthranilic acid, 3-chloro- | $C_7H_6ClNO_2$ | 67915 |
|  | Mol. wt. 171.5 | |
| | m.p. 148° | |
| Anthranilic acid, 4-chloro- | $C_7H_6ClNO_2$ | 13435, 15820 67800, 67910 |
|  | Mol. wt. 171.5 | |
| | m.p. 231° | |
| Anthranilic acid, 3,5-dichloro- | $C_7H_5Cl_2NO_2$ | 67915 |
|  | Mol. wt. 206 | |
| | m.p. 231° | |
| Anthranilic acid, <i>N</i> -(6-hydroxy-2-naphthylsulfonyl)- | $C_{17}H_{13}NO_5S$ | 16315 |
|  | Mol. wt. 343 | |
| Anthranilic acid, <i>N</i> -[<i>p</i> -(<i>p</i> -hydroxyanilino)phenyl]- | $C_{19}H_{16}N_2O_3$ | 53480, 53481 |
|  | Mol. wt. 320 | |
| Anthranilic acid, <i>N</i> -[<i>m</i> -(3-methyl-5-oxo-2-pyrazolin-1-yl)phenylsulfonyl]- | $C_{17}H_{15}N_3O_5S$ | 18885 |
|  | Mol. wt. 373 | |
| Anthranilic acid, 5-nitro- | $C_7H_6N_2O_4$ | 25355 30400 35810, 36250 |
|  | Mol. wt. 182 | |
| Anthranilic acid, 4-sulfo- | $C_7H_7NO_5S$ | 18700, 19010 29295 |
|  | Mol. wt. 217 | |

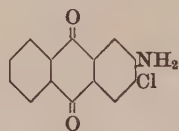
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|---|----------------------|--|
| Anthranilic acid, 5-sulfo- | $C_7H_7NO_5S$ | 29295 |
|  | Mol. wt. 217 | |
| Anthranilic acid, 5,5'-ureylenedi- | $C_{15}H_{14}N_4O_5$ | 25340, 25345, 25350, 25355 |
|  | Mol. wt. 330 | |
| 9-Anthranol | | |
| <i>See 9-Anthrol</i> | | |
| Anthrapurpurin | $C_{14}H_8O_5$ | 58260, 58615 |
|  | Mol. wt. 256 | |
| | m.p. 369° | |
| Anthrapurpurin, 3-nitro- | $C_{14}H_7NO_7$ | 58620 |
|  | Mol. wt. 301 | |
| Anthra[1,2-b]pyrazin-7,12-dione, 2,3-dihydroxy- | | |
| <i>See Naphtho[2,3-f]quinoxaline-7,12-dione, 2,3-dihydroxy-</i> | | |
| Anthra[1,9]pyrazol-6(2H)-one | $C_{14}H_8N_2O$ | 70315, 70320, 70325, 70330, 70331, 70335, 70500, 70505, 71000, 71001 |
|  | Mol. wt. 220 | |
| Anthra[1,9]pyrazol-6(2H)-one, 3-bromo- | $C_{14}H_7BrN_2O$ | 70315, 70320, 70325 |
|  | Mol. wt. 299 | |
| 1(N),9-Anthrapyridone, 4-bromo-N-methyl- | | |
| <i>See 7H-Dibenz[f,ij]isoquinoline-2,7(3H)-dione, 6-bromo-3-methyl-</i> | | |
| 1(N),9-Anthrapyridone, 4-chloro-N-methyl- | | |
| <i>See 7H-Dibenz[f,ij]isoquinoline-2,7(3H)-dione, 6-chloro-3-methyl-</i> | | |
| 1,9-Anthrapyrimidine, 2,4-dibromo- | | |
| <i>See 7H-Dibenzo[de,h]quinazolin-7-one, 4,6-dibromo-</i> | | |
| Anthraquinone | $C_{14}H_8O_2$ | 58000, 58050, 58815, 58820, 61900 |
|  | Mol. wt. 208 | |
| | m.p. 286° | |
| Anthraquinone, 1-acetamido- | $C_{16}H_{11}NO_3$ | 66050 |
|  | Mol. wt. 265 | |
| | m.p. 218° | |

| | | |
|---|------------------------|---|
| Anthraquinone, 2-acetamido- | $C_{18}H_{11}NO_3$ | 66055 |
|  | Mol. wt. 265 | |
| | m.p. 262° | |
| Anthraquinone, 1-amino- | $C_{14}H_9NO_2$ | 37275 |
|  | Mol. wt. 223 | 60020, 60515, 60520, 60525, 60605, 60610, 60530, 60531, 65000, 65015, 65025, 65205, 65215, 65230, 65400, 65410, 65429, 66705, 66706, 66810, 69500, 69501, 69505, 69510, 69511, 69525, 69526, 69530, 69535, 69540, 70315, 70320, 70325, 70910, 71000, 71001, 71050 |
| | m.p. 252° | |
| Anthraquinone, 2-amino- | $C_{14}H_9NO_2$ | 65015, 65250, 65435, 65660, 66000, 68230, 68705, 69540, 69800, 69801, 69805, 69810, 69815, 69816, 69825, 69826, 69830, 69835, 69840, 70005, 70010, 70600, 70601 |
|  | Mol. wt. 223 | |
| | m.p. 303° | |
| Anthraquinone, 1-amino-4-anilino-2-bromo- | $C_{20}H_{13}BrN_2O_2$ | 69855 |
|  | Mol. wt. 393 | |
| Anthraquinone, 1-(p-aminoanilino)-4-methylamino- | $C_{21}H_{17}N_3O_2$ | 61540 |
|  | Mol. wt. 343 | |
| Anthraquinone, 1-amino-4-benzamido- | $C_{21}H_{14}N_2O_3$ | 65020, 65225, 65415, 66700, 69005, 69015, 69016, 69020 |
|  | Mol. wt. 354 | |
| | m.p. 280° | |
| Anthraquinone, 1-amino-5-benzamido- | $C_{21}H_{14}N_2O_3$ | 65405, 65415, 65420, 65425, 65430, 66700, 67820, 69025, 69530, 69535, 70510, 70905, 71025 |
|  | Mol. wt. 342.5 | |
| | m.p. 244-245° | |
| Anthraquinone, 1-amino-2-bromo- | $C_{14}H_8BrNO_2$ | 69800, 69801, 69805, 69810, 69815, 69816, 69825, 69830, 69835, 69840 |
|  | Mol. wt. 302 | |
| | m.p. 182° | |
| Anthraquinone, 1-amino-3-bromo- | $C_{14}H_8BrNO_2$ | 11750 |
|  | Mol. wt. 302 | |

| | | |
|---|--|--|
| Anthraquinone, 1-amino-4-bromo- | $C_{14}H_8BrNO_2$ | 61107, 62080, 62085, 62090, 62095, 65005 |
|  | Mol. wt. 302 | |
| Anthraquinone, 2-amino-3-bromo- | $C_{14}H_8BrNO_2$ | 70605 |
|  | Mol. wt. 302 m.p. 307° | |
| Anthraquinone, 1-amino-2-bromo-4-hydroxy- | $C_{14}H_8BrNO_3$ | 69845 |
|  | Mol. wt. 318 | |
| Anthraquinone, 2-amino-1-bromo-3-chloro- | $C_{14}H_7BrClNO_2$ | 69825 |
|  | Mol. wt. 336.5 m.p. 235° | |
| Anthraquinone, 1-amino-4-bromo-2-methyl- | $C_{15}H_{10}BrNO_2$ | 62160 |
|  | Mol. wt. 316 m.p. 246–247° (decomp.) | |
| Anthraquinone, 1-amino-4-chloro- | $C_{14}H_8ClNO_2$ | 62080, 62085, 62090, 62095 |
|  | Mol. wt. 257.5 m.p. 180° | |
| Anthraquinone, 1-amino-6-chloro- | $C_{14}H_8ClNO_2$ | 65220 |
|  | Mol. wt. 257.5 m.p. 210–211° | |
| Anthraquinone, 1-amino-7-chloro- | $C_{14}H_8ClNO_2$ | 60600 |
|  | Mol. wt. 257.5 m.p. 212–213° | |
| Anthraquinone, 2-amino-1-chloro- | $C_{14}H_8ClNO_2$ | 70405 |
|  | Mol. wt. 257.5 m.p. 237° | |

Anthraquinone, 2-amino-3-chloro- $C_{14}H_8ClNO_2$

67100, 67105, 67110, 69825, 69826

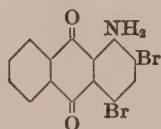


Mol. wt. 257.5

m.p. 310–311°

Anthraquinone, 1-amino-2,4-dibromo- $C_{14}H_7Br_2NO_2$

62055, 62070, 62075, 62100, 62105, 62110

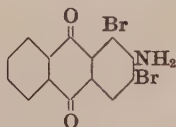


Mol. wt. 381

m.p. 226°

Anthraquinone, 2-amino-1,3-dibromo- $C_{14}H_7Br_2NO_2$

69815, 69816, 69825, 70605

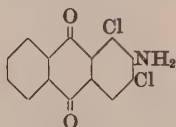


Mol. wt. 381

m.p. 249.5°

Anthraquinone, 2-amino-1,3-dichloro- $C_{14}H_7Cl_2NO_2$

69825, 69826

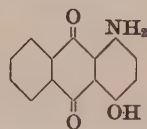


Mol. wt. 292

m.p. 231°

Anthraquinone, 3-amino-1,2-dihydroxy-*See Alizarin, 3-amino-***Anthraquinone, 4-amino-1,2-dihydroxy-***See Alizarin, 4-amino-***Anthraquinone, 1-amino-4-hydroxy-** $C_{14}H_9NO_3$

60745, 61110

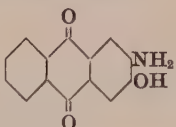


Mol. wt. 239

m.p. 207–208°

Anthraquinone, 2-amino-3-hydroxy- $C_{14}H_9NO_3$

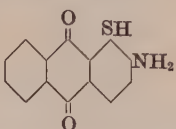
67000, 67001



Mol. wt. 239

Anthraquinone, 2-amino-1-mercapto- $C_{14}H_9NO_2S$

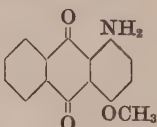
66805, 70400, 70405



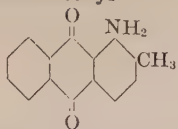
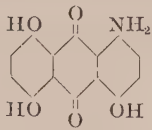
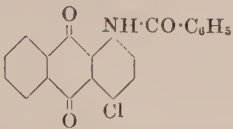
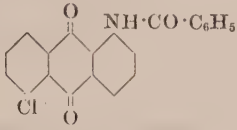
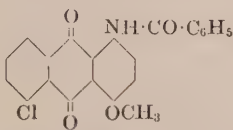
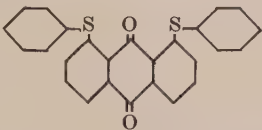
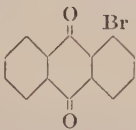
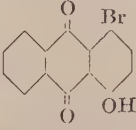
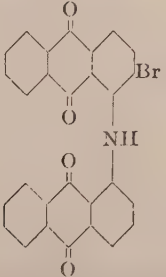
Mol. wt. 255

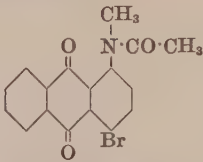
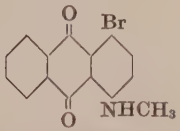
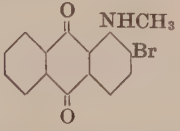
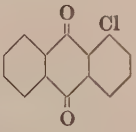
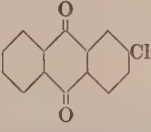
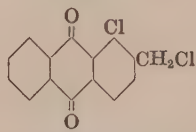
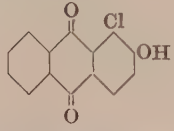
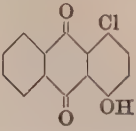
Anthraquinone, 1-amino-4-methoxy- $C_{15}H_{11}NO_3$

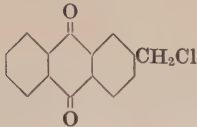
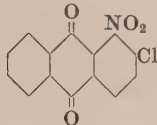
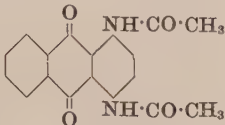
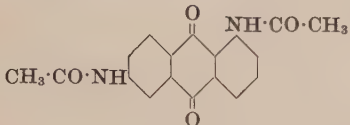
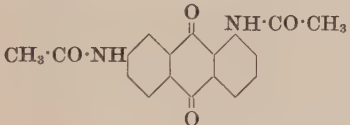
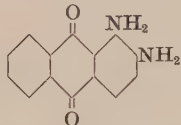
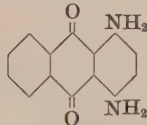
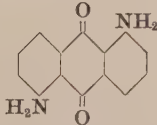
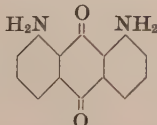
60750, 65210, 65705, 65710

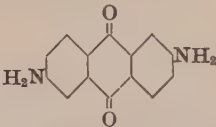
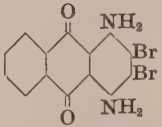
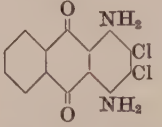
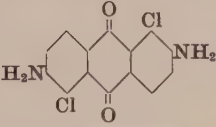
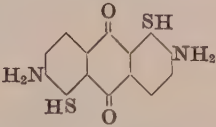
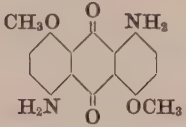
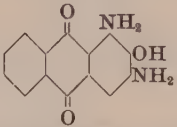
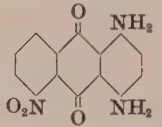
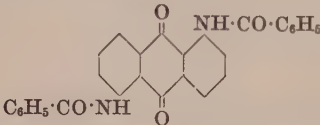


Mol. wt. 253

| | | | |
|--|---|---|---|
| Anthraquinone, 1-amino-2-methyl- |  | $C_{15}H_{11}NO_2$ Mol. wt. 237 m.p. 205° | 62080, 62085, 62090, 62095, 65270, 66505, 66515 |
| Anthraquinone, 1-amino-4,5,8-trihydroxy- |  | $C_{14}H_9NO_5$ Mol. wt. 271 | 60770 |
| Anthraquinone, 3-amino-1,2,6-trihydroxy- | <i>See Flavopurpurin, 3-amino-</i> | | |
| Anthraquinone, 1-benzamido-4-chloro- |  | $C_{21}H_{12}ClNO_3$ Mol. wt. 361.5 | 60710, 69005, 70810 |
| Anthraquinone, 1-benzamido-5-chloro- |  | $C_{21}H_{12}ClNO_3$ Mol. wt. 361.5 m.p. 218–219° | 69015, 69016, 69025, 70900 |
| Anthraquinone, 1-benzamido-5-chloro-4-methoxy- |  | $C_{22}H_{14}ClNO_4$ Mol. wt. 391.5 | 69020 |
| Anthraquinone, 1,8-bis(phenylthio)- |  | $C_{26}H_{16}O_2S_2$ Mol. wt. 424 | 58840 |
| Anthraquinone, 1-bromo- |  | $C_{14}H_7BrO_2$ Mol. wt. 287 m.p. 204–205° | 70800, 70801, 70802, 70805, 70806 |
| Anthraquinone, 2-bromo-1,4-dihydroxy- | <i>See Quinizarin, 2-bromo-</i> | | |
| Anthraquinone, 1-bromo-4-hydroxy- |  | $C_{14}H_7BrO_3$ Mol. wt. 303 m.p. 197–198° | 60725, 60730 |
| Anthraquinone, 2-bromo-1,1'-iminodi- |  | $C_{28}H_{14}BrNO_4$ Mol. wt. 508 | 69000 |

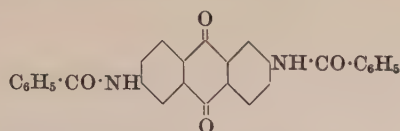
| | | |
|---|----------------------|---|
| Anthraquinone, 1-bromo-4-(N-methylacetamido)- | $C_{17}H_{12}BrNO_3$ | 68200, 68205, 68210, 68215, 68220, 68225, 68230 |
|  | Mol. wt. 358 | |
| Anthraquinone, 1-bromo-4-methylamino- | $C_{15}H_{10}BrNO_2$ | 61505, 61520, 61525, 61530 |
|  | Mol. wt. 316 | |
| | m.p. 194° | |
| Anthraquinone, 2-bromo-1-methylamino- | $C_{15}H_{10}BrNO_2$ | 70000 |
|  | Mol. wt. 316 | |
| | m.p. 170-172° | |
| Anthraquinone, 3-bromo-1'-p-tolyl-1,2-triazolo- <i>See Anthra[1,2]triazole-6,11-dione, 4-bromo-1-p-tolyl-</i> | | |
| Anthraquinone, 1-chloro- | $C_{14}H_7ClO_2$ | 60505, 60507, 60510, 65000, 67800, 70315, 70800, 70801, 70802, 70805, 70806 |
|  | Mol. wt. 242.5 | |
| | m.p. 162° | |
| Anthraquinone, 2-chloro- | $C_{14}H_7ClO_2$ | 58000, 65015, 65020, 65200 |
|  | Mol. wt. 242.5 | |
| | m.p. 211° | |
| Anthraquinone, 1-chloro-2-(chloromethyl)- | $C_{15}H_8Cl_2O_2$ | 69705 |
|  | Mol. wt. 291 | |
| Anthraquinone, 2-chloro-1,4-dihydroxy- <i>See Quinizarin, 2-chloro-</i> | | |
| Anthraquinone, 1-chloro-2-hydroxy- | $C_{14}H_7ClO_3$ | 70100 |
|  | Mol. wt. 258.5 | |
| | m.p. 226° | |
| Anthraquinone, 1-chloro-4-hydroxy- | $C_{14}H_7ClO_3$ | 60725, 60730 |
|  | Mol. wt. 258.5 | |
| | m.p. 193-194° | |

| | | |
|---|----------------------|---|
| Anthraquinone, 2-(chloromethyl)- | $C_{15}H_9ClO_2$ | 58950, 69705 |
|  | Mol. wt. 256.5 | m.p. 164.5° |
| Anthraquinone, 2-chloro-1-nitro- | $C_{14}H_8ClNO_4$ | 69000 |
|  | Mol. wt. 287.5 | |
| Anthraquinone, 1,4-diacetamido- | $C_{18}H_{14}N_2O_4$ | 61140 |
|  | Mol. wt. 322 | m.p. 271° |
| Anthraquinone, 1,6-diacetamido- | $C_{18}H_{14}N_2O_4$ | 66050, 66055 |
|  | Mol. wt. 322 | m.p. 295° |
| Anthraquinone, 1,7-diacetamido- | $C_{18}H_{14}N_2O_4$ | 66050, 66055 |
|  | Mol. wt. 322 | m.p. 283° |
| Anthraquinone, 1,2-diamino- | $C_{14}H_{10}N_2O_2$ | 68300 |
|  | Mol. wt. 238 | m.p. 303° |
| Anthraquinone, 1,4-diamino- | $C_{14}H_{10}N_2O_2$ | 61105, 61550, 61575, 61650, 61655, 62010, 62030, 65005, 70800, 70801, 70802 |
|  | Mol. wt. 238 | m.p. 268° |
| Anthraquinone, 1,5-diamino- | $C_{14}H_{10}N_2O_2$ | 61725, 61726, 61730, 61735, 61736, 61740, 64500, 64505, 64510, 65200, 65260, 65265, 66000, 69515, 69520, 70805, 70806, 70810, 70900 |
|  | Mol. wt. 238 | m.p. 319° |
| Anthraquinone, 1,8-diamino- | $C_{14}H_{10}O_2N_2$ | 61730, 65260 |
|  | Mol. wt. 238 | m.p. 262° |

| | | |
|---|--------------------------------------|-----------------------------------|
| Anthraquinone, 2,6-diamino- | $C_{14}H_{10}O_2N_2$ | 67300, 67301 |
|  | Mol. wt. 238 | |
| | m.p. 310–320° | |
| Anthraquinone, 1,4-diamino-2,3-dibromo- | $C_{14}H_8Br_2N_2O_2$ | 69850 |
|  | Mol. wt. 396 | |
| Anthraquinone, 1,4-diamino-2,3-dichloro- | $C_{14}H_8Cl_2N_2O_2$ | 61102, 62020, 62025, 62026, 69850 |
|  | Mol. wt. 307 | |
| Anthraquinone, 2,6-diamino-1,5-dichloro- | $C_{14}H_8Cl_2N_2O_2$ | 67300, 67301 |
|  | Mol. wt. 307 | |
| Anthraquinone, 1,5-diamino-4,8-dihydroxy- | <i>See Anthrarufin, 4,8-diamino-</i> | |
| Anthraquinone, 2,6-diamino-1,5-dimercapto- | $C_{14}H_{10}N_2O_2S_2$ | 67300, 67301 |
|  | Mol. wt. 302 | |
| Anthraquinone, 1,5-diamino-4,8-dimethoxy- | $C_{16}H_{14}N_2O_4$ | 63295 |
|  | Mol. wt. 298 | |
| Anthraquinone, 1,3-diamino-2-hydroxy- | $C_{14}H_{10}N_2O_3$ | 58200 |
|  | Mol. wt. 254 | |
| Anthraquinone, 1,4-diamino-5-nitro- | $C_{14}H_8N_3O_4$ | 62505, 62510 |
|  | Mol. wt. 283 | |
| Anthraquinone, 1,5-dibenzamido- | $C_{28}H_{18}N_2O_4$ | 63350 |
|  | Mol. wt. 446 | |
| | m.p. > 350° | |

Anthraquinone, 2,6-dibenzamido- $C_{28}H_{18}N_2O_4$

67300, 67301

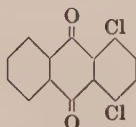


Mol. wt. 446

m.p. 300°

Anthraquinone, 1,5-dibromo-4,8-dihydroxy-*See* Anthrarufin, 4,8-dibromo-**Anthraquinone, 2,6-dibromo-1,5-dihydroxy-4,8-dinitro-***See* Anthrarufin, 2,6-dibromo-4,8-dinitro-**Anthraquinone, 1,4-dichloro-** $C_{14}H_6Cl_2O_2$

58050, 61565, 61570, 61650

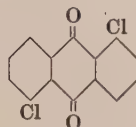


Mol. wt. 277

m.p. 185°

Anthraquinone, 1,5-dichloro- $C_{14}H_6Cl_2O_2$

61700, 61705, 61710, 61715, 61720, 68700

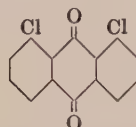


Mol. wt. 277

m.p. 251°

Anthraquinone, 1,8-dichloro- $C_{14}H_6Cl_2O_2$

61700, 61705, 61800

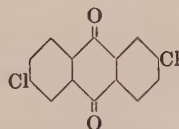


Mol. wt. 277

m.p. 202–203°

Anthraquinone, 2,6-dichloro- $C_{14}H_6Cl_2O_2$

65205, 65210

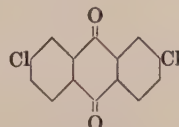


Mol. wt. 277

m.p. 280–282°

Anthraquinone, 2,7-dichloro- $C_{14}H_6Cl_2O_2$

65215, 65220



Mol. wt. 277

m.p. 208–210°

Anthraquinone, 1,5-dichloro-4,8-dihydroxy-*See* Anthrarufin, 4,8-dichloro-**Anthraquinone, 2,6-dichloro-1,5-dihydroxy-4,8-dinitro-***See* Anthrarufin, 2,6-dichloro-4,8-dinitro-**Anthraquinone, 1,3-dihydroxy-***See* Xanthopurpurin**Anthraquinone, 1,4-dihydroxy-***See* Quinizarin

Anthraquinone, 1,5-dihydroxy-

See Anthrarufin

Anthraquinone, 1,8-dihydroxy-

See Chrysazin

Anthraquinone, 1,5-dihydroxy-4,8-dinitro-

See Anthrarufin, 4,8-dinitro-

Anthraquinone, 1,2-dihydroxy-3-nitro-

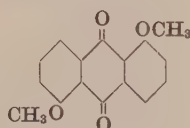
See Alizarin, 3-nitro-

Anthraquinone, 1,2-(dihydroxypyrazino)-

See Naphtho[2,3-*f*]quinoxaline-7,12-dione, 2,3-dihydroxy-

Anthraquinone, 1,5-dimethoxy-

$C_{16}H_{12}O_4$ 63330

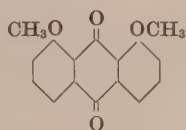


Mol. wt. 268

m.p. 236°

Anthraquinone, 1,8-dimethoxy-

$C_{16}H_{12}O_4$ 63330

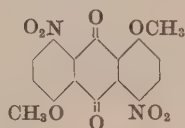


Mol. wt. 268

m.p. 219°

Anthraquinone, 1,5-dimethoxy-4,8-dinitro-

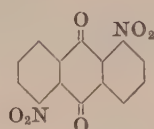
$C_{16}H_{10}N_2O_8$ 63000



Mol. wt. 358

Anthraquinone, 1,5-dinitro-

$C_{14}H_6N_2O_8$ 53330



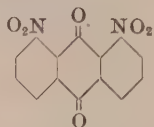
Mol. wt. 298

58605, 58610, 58800, 58805, 58810, 61705, 61710, 61715, 63015, 64500, 64505, 64515

Anthraquinone, 1,8-dinitro-

$C_{14}H_6N_2O_8$

58800, 58805, 58810, 61705, 61800, 64500, 64505, 64515



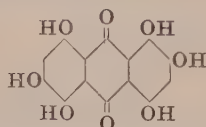
Mol. wt. 298

m.p. 312°

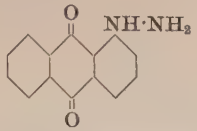
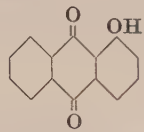
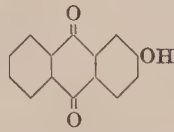
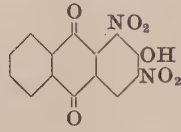
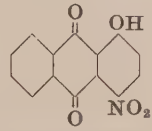
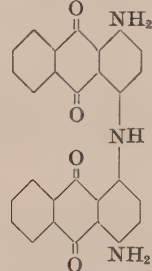
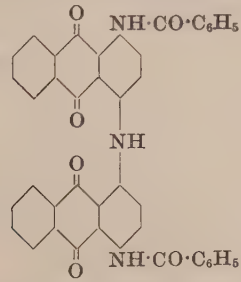
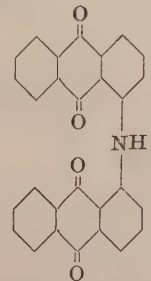
Anthraquinone, 1,2,4,5,6,8-hexahydroxy-

$C_{14}H_8O_8$

58610, 58611

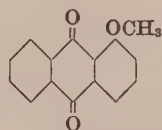


Mol. wt. 304

| | | |
|---|--|---------------------|
| Anthraquinone, 1-hydrazino-  | $C_{14}H_{10}N_2O_2$ Mol. wt. 238 m.p. 210° (decomp.) | 70315, 70320, 70325 |
| Anthraquinone, 1-hydroxy-  | $C_{14}H_8O_3$ Mol. wt. 224 m.p. 193° | 58050, 60710 |
| Anthraquinone, 2-hydroxy-  | $C_{14}H_8O_3$ Mol. wt. 224 m.p. 306° | 58050 |
| Anthraquinone, 2-hydroxy-1,3-dinitro-  | $C_{14}H_6N_2O_7$ Mol. wt. 314 m.p. 268-270° | 58200 |
| Anthraquinone, 1-hydroxy-4-nitro-  | $C_{14}H_7NO_5$ Mol. wt. 269 m.p. 268° | 58050, 60710 |
| Anthraquinone, 1,1'-iminobis[4-amino-  | $C_{28}H_{17}N_3O_4$ Mol. wt. 459 | 69010 |
| Anthraquinone, 1,1'-iminobis[4-benzamido-  | $C_{42}H_{25}N_3O_6$ Mol. wt. 667 | 69005 |
| Anthraquinone, 1,1'-iminodi-  | $C_{28}H_{15}NO_4$ Mol. wt. 429 | 65005, 65010, 69000 |

Anthraquinone, 1-methoxy-
 $C_{16}H_{10}O_3$

60710

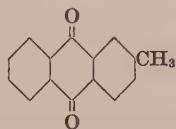


Mol. wt. 238

m.p. 170°

Anthraquinone, 2-methyl-
 $C_{16}H_{10}O_2$

58000, 58950, 60700, 62080, 62085, 62090, 62095, 66500, 66510, 69700

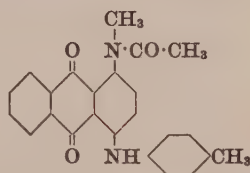


Mol. wt. 222

m.p. 177–179°
sublimes

Anthraquinone, 1-(*N*-methylacetamido)-4-*p*-toluidino-
 $C_{24}H_{20}N_2O_3$

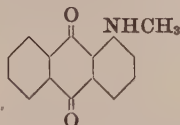
68210, 68215



Mol. wt. 384

Anthraquinone, 1-methylamino-
 $C_{15}H_{11}NO_2$

61515, 65255

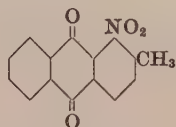


Mol. wt. 237

m.p. 170°

Anthraquinone, 2-methyl-1-nitro-
 $C_{15}H_9NO_4$

67815, 67900, 67905

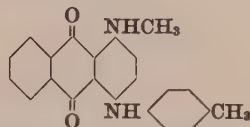


Mol. wt. 267

m.p. 269–270°

Anthraquinone, 1-methylamino-4-*p*-toluidino-
 $C_{22}H_{18}N_2O_2$

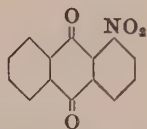
68500



Mol. wt. 342

Anthraquinone, 1-nitro-
 $C_{14}H_7NO_4$

65015

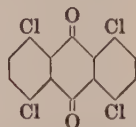


Mol. wt. 253

m.p. 230°

Anthraquinone, 1,4,5,8-tetrachloro-
 $C_{14}H_4Cl_4O_2$

71050

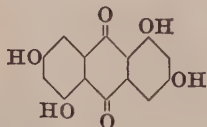


Mol. wt. 346

m.p. 341–342°

Anthraquinone, 1,3,5,7-tetrahydroxy-
 $C_{14}H_8O_6$

58510, 58515

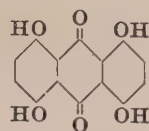


Mol. wt. 272

m.p. > 360°

Anthraquinone, 1,4,5,8-tetrahydroxy- $C_{14}H_8O_6$

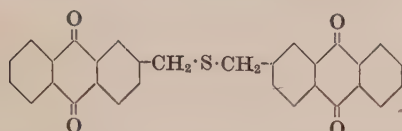
62500, 62560, 62565, 62570



Mol. wt. 272

m.p. $> 300^\circ$ **Anthraquinone, 2,2'-(thiodimethylene)di-** $C_{30}H_{18}O_4S$

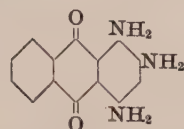
58950



Mol. wt. 474

Anthraquinone, 1,2,4-triamino- $C_{14}H_{11}N_3O_2$

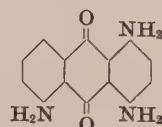
66795, 66800



Mol. wt. 253

m.p. $> 300^\circ$ **Anthraquinone, 1,4,5-triamino-** $C_{14}H_{11}N_3O_2$

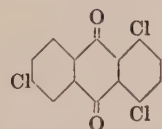
64015



Mol. wt. 253

Anthraquinone, 1,4,6-trichloro- $C_{14}H_3Cl_3O_2$

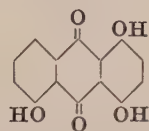
62575



Mol. wt. 311.5

m.p. 238° **Anthraquinone, 1,4,5-trihydroxy-** $C_{14}H_8O_5$

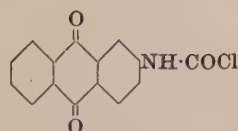
62545, 62550



Mol. wt. 256

m.p. $270-271^\circ$ **Anthraquinone, 1,2,6-trihydroxy-3-nitro-***See* Flavopurpurin, 3-nitro-**Anthraquinone, 1,2,7-trihydroxy-3-nitro-***See* Anthrapurpurin, 3-nitro-**2-Anthraquinonecarbamoyl chloride** $C_{15}H_9ClNO_3$

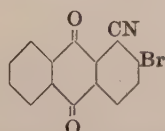
65435, 65600, 66000



Mol. wt. 285.5

decomp. 230° **1-Anthraquinonecarbonitrile, 2-bromo-** $C_{15}H_8BrNO_2$

69540



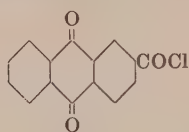
Mol. wt. 312

m.p. 308°

2-Anthraquinonecarbonyl chloride

 $C_{15}H_7ClO_3$

69010



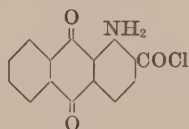
Mol. wt. 270.5

m.p. 147°

2-Anthraquinonecarbonyl chloride, 1-amino-

 $C_{15}H_8ClNO_3$

67815, 69535

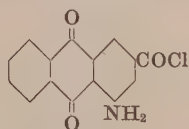


Mol. wt. 285.5

2-Anthraquinonecarbonyl chloride, 4-amino-

 $C_{15}H_8ClNO_3$

69535

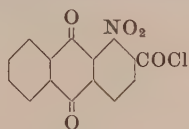


Mol. wt. 285.5

2-Anthraquinonecarbonyl chloride, 1-nitro-

 $C_{15}H_6ClNO_6$

67000, 67001



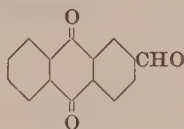
Mol. wt. 315.5

m.p. 243–244°

2-Anthraquinonecarboxaldehyde

 $C_{15}H_8O_3$

66510



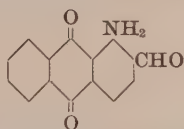
Mol. wt. 236

m.p. 188–189°

2-Anthraquinonecarboxaldehyde, 1-amino-

 $C_{15}H_9NO_3$

59270, 60705, 66805

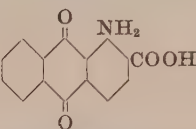


Mol. wt. 251

2-Anthraquinonecarboxylic acid, 1-amino-

 $C_{15}H_9NO_4$

67900, 67905, 68605, 68610



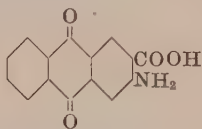
Mol. wt. 267

m.p. 295–296°

2-Anthraquinonecarboxylic acid, 3-amino-

 $C_{15}H_9NO_4$

70700

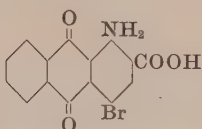


Mol. wt. 267

m.p. 362–363°

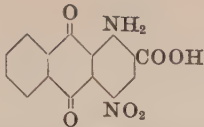
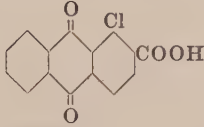
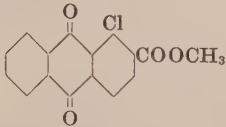
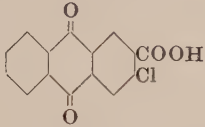
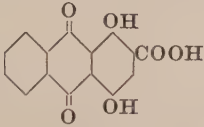
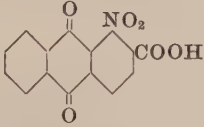
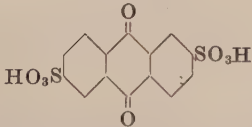
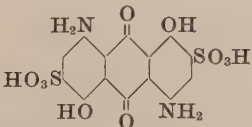
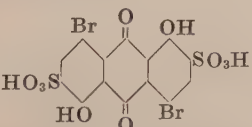
2-Anthraquinonecarboxylic acid,
1-amino-4-bromo- $C_{15}H_8BrNO_4$

62065



Mol. wt. 346

m.p. 324–325°

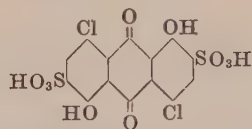
| | | |
|---|----------------------------|--|
| 2-Anthraquinonecarboxylic acid, 1-amino-4-nitro- | $C_{16}H_8N_2O_6$ | 67105, 67110 |
|  | Mol. wt. 312 | |
| 2-Anthraquinonecarboxylic acid, 1-chloro- | $C_{15}H_7ClO_4$ | 68000, 68600, 68605, 68610, 68615, 69540 |
|  | Mol. wt. 286.5 | |
| | m.p. 272° | |
| 2-Anthraquinonecarboxylic acid, 1-chloro-, methyl ester | $C_{16}H_9ClO_4$ | 67810 |
|  | Mol. wt. 300.5 | |
| | m.p. 161.5° | |
| 2-Anthraquinonecarboxylic acid, 3-chloro- | $C_{15}H_7ClO_4$ | 58220 |
|  | Mol. wt. 286.5 | |
| | m.p. 285° | |
| 2-Anthraquinonecarboxylic acid, 1,4-dihydroxy- | $C_{15}H_8O_6$ | 58220 73685 |
|  | Mol. wt. 284 | |
| | m.p. 249–250° | |
| 2-Anthraquinonecarboxylic acid, 1-nitro- | $C_{15}H_7NO_6$ | 67100, 67820, 68000, 69540, 70695 |
|  | Mol. wt. 297 | |
| | m.p. 285–287° | |
| 2,6-Anthraquinonedisulfonic acid | $C_{14}H_8O_8S_2$ | 58240 |
|  | Mol. wt. 368 | |
| | Forms a hexahydrate | |
| 2,6-Anthraquinonedisulfonic acid, 4,8-diamino-1,5-dihydroxy- | $C_{14}H_{10}N_2O_{10}S_2$ | 63000 |
|  | Mol. wt. 430 | |
| 2,6-Anthraquinonedisulfonic acid, 4,8-dibromo-1,5-dihydroxy- | $C_{14}H_6Br_2O_{10}S_2$ | 63005, 63015 |
|  | Mol. wt. 558 | |

2,6-Anthraquinonedisulfonic acid,
4,8-dichloro-1,5-dihydroxy-

$C_{14}H_6Cl_2O_{10}S$

63005, 63015

Mol. wt. 469

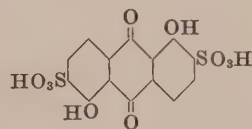


2,6-Anthraquinonedisulfonic acid,
1,5-dihydroxy-

$C_{14}H_8O_{10}S_2$

63330

Mol. wt. 400

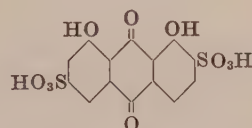


2,6-Anthraquinonedisulfonic acid,
1,8-dihydroxy-

$C_{14}H_8O_{10}S_2$

63330

Mol. wt. 400

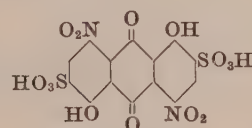


2,6-Anthraquinonedisulfonic acid,
1,5-dihydroxy-4,8-dinitro-

$C_{14}H_6N_2O_{14}S_2$

58100, 63000

Mol. wt. 490

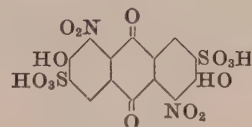


2,6-Anthraquinonedisulfonic acid,
3,7-dihydroxy-4,8-dinitro-

$C_{14}H_6N_2O_{14}S_2$

63335

Mol. wt. 490

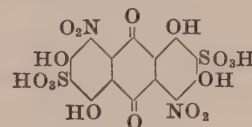


2,6-Anthraquinonedisulfonic acid,
1,3,5,7-tetrahydroxy-4,8-dinitro-

$C_{14}H_6N_2O_{16}S_2$

63015

Mol. wt. 522

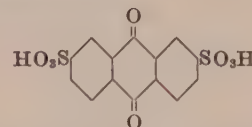


2,7-Anthraquinonedisulfonic acid

$C_{14}H_8O_8S_2$

58255

Mol. wt. 368



Sodium salt forms
a tetrahydrate

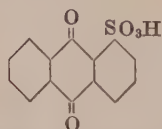
1-Anthraquinonesulfonic acid

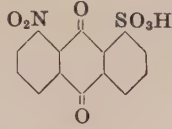
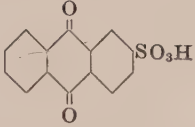
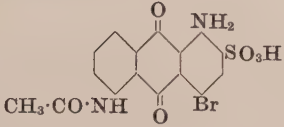
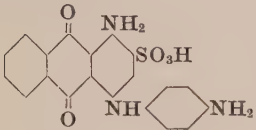
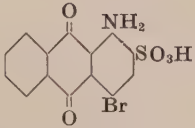
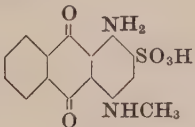
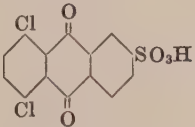
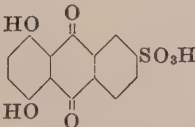
$C_{14}H_8O_5S$

60505, 62060, 65015

Mol. wt. 288

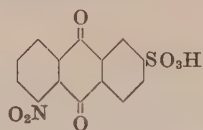
m.p. 218°



| | | |
|---|---|--|
| 1-Anthraquinonesulfonic acid, 8-nitro- | $C_{14}H_7NO_7S$ | 69800, 69801, 69805, 69810, 69815, 69816, 69825, 69826, 69830, 69835, 69840 |
|  | Mol. wt. 333 | |
| 2-Anthraquinonesulfonic acid | $C_{14}H_8O_5S$ | 58000 |
|  | Mol. wt. 288 | |
| | Forms a trihydrate (Sodium salt forms monohydrate) | |
| 2-Anthraquinonesulfonic acid, 5-acetamido-1-amino-4-bromo- | $C_{16}H_{11}BrN_2O_6S$ | 64005, 64010 |
|  | Mol. wt. 439 | |
| 2-Anthraquinonesulfonic acid, 1-amino-4-(p-aminoanilino)- | $C_{20}H_{15}N_3O_5S$ | 14155 |
|  | Mol. wt. 339 | |
| 2-Anthraquinonesulfonic acid, 1-amino-4-bromo- | $C_{14}H_8BrNO_5S$ | 61135, 61200, 61205, 61205:1, 61211, 62000, 62015, 62040, 62045, 62050, 62055, 62115, 62120, 62125, 62130, 62135, 62140, 62145, 62150, 62155, 62520, 67910, 67915, 67920 |
|  | Mol. wt. 382 | |
| 2-Anthraquinonesulfonic acid, 1-amino-4-methylamino- | $C_{15}H_{12}N_2O_5S$ | 62035 |
|  | Mol. wt. 332 | |
| 2-Anthraquinonesulfonic acid, 5,8-dichloro- | $C_{14}H_6Cl_2O_5S$ | 62530 |
|  | Mol. wt. 357 | |
| 2-Anthraquinonesulfonic acid, 5,8-dihydroxy- | $C_{14}H_8O_7S$ | 58061, 58065 |
|  | Mol. wt. 320 | |

2-Anthraquinonesulfonic acid, 5-nitro- $C_{14}H_7NO_7S$

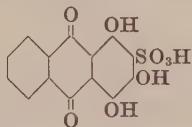
62515, 62535



Mol. wt. 333

m.p. 255°
(decomp.)**2-Anthraquinonesulfonic acid, 1,3,4-trihydroxy-** $C_{14}H_8O_8S$

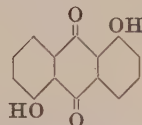
60760



Mol. wt. 336

Anthrarufin $C_{14}H_8O_4$

58080, 58230, 63005, 63010, 63011, 63315, 63325

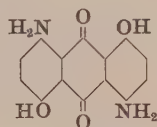


Mol. wt. 240

m.p. 280°

Anthrarufin, 4,8-diamino- $C_{14}H_{10}N_2O_4$

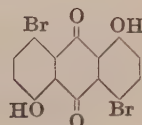
63000, 63305, 63315, 63320, 63325, 63355, 63360, 63365



Mol. wt. 270

Anthrarufin, 4,8-dibromo- $C_{14}H_6Br_2O_4$

63330

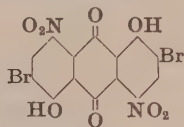


Mol. wt. 398

m.p. > 315°

Anthrarufin, 2,6-dibromo-4,8-dinitro- $C_{14}H_4Br_2N_2O_8$

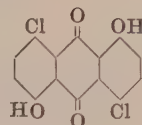
63005, 63010



Mol. wt. 488

Anthrarufin, 4,8-dichloro- $C_{14}H_6Cl_2O_4$

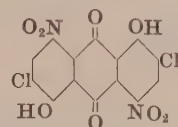
63340



Mol. wt. 309

Anthrarufin, 2,6-dichloro-4,8-dinitro- $C_{14}H_4Cl_2N_2O_8$

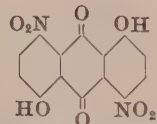
63005, 63010



Mol. wt. 399

Anthrarufin, 4,8-dinitro- $C_{14}H_6N_2O_8$

63300, 63305



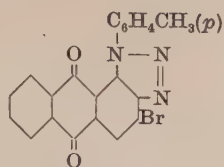
Mol. wt. 330

m.p. > 330°

**1H-Anthra[1,2]triazole-6,11-dione,
4-bromo-1-p-tolyl-**

$C_{21}H_{12}BrN_3O_2$

66810



Mol. wt. 418

1-Anthrol



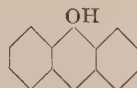
$C_{14}H_{10}O$

73820, 73845, 73850

Mol. wt. 194

m.p. 152°

9-Anthrol



$C_{14}H_{10}O$

59800

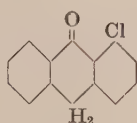
Mol. wt. 194

m.p. 163-170°
(decomp.)

Anthrone, 2-bromo-1,9-pyrazolo-

See Anthra[1,9]pyrazol-6(2H)-one, 3-bromo-

Anthrone, 1-chloro-



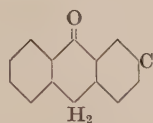
$C_{15}H_9ClO$

71025

Mol. wt. 240.5

m.p. 118°

Anthrone, 2-chloro-



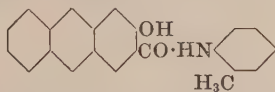
$C_{15}H_9ClO$

59500

Mol. wt. 240.5

m.p. 155°

2-Anthro-o-toluidide, 3-hydroxy-



$C_{22}H_{18}NO$

37585

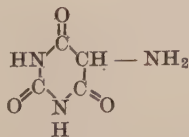
Mol. wt. 310

Azoxybenzene, 3,3'-diamino-

See Aniline, 3,3'-azoxydi-

B

Barbituric acid, 5-amino-



$C_4H_5N_3O_3$

56085

Mol. wt. 143

Benzaldehyde



C_7H_6O

42000, 42040, 42060, 42065, 42070, 42075, 42085, 42095, 42160,
42634, 42635, 42715, 42740, 43550, 43555

Mol. wt. 106

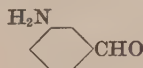
45090, 46055, 46065, 46070

49015

66795, 67300, 67301

b.p. 179°

Benzaldehyde, m-amino-


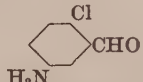
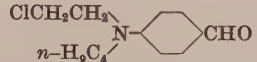
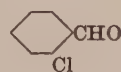

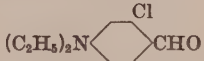
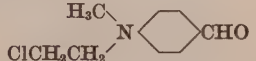
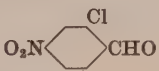
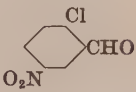
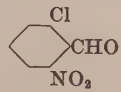
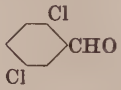


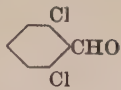
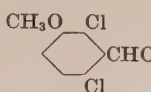
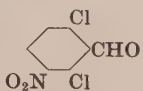


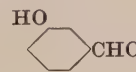

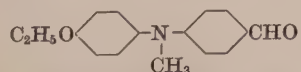
C_7H_7NO

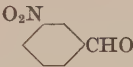
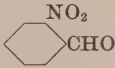
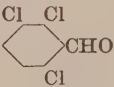


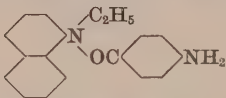
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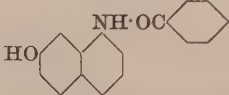
Mol. wt. 121

m.p. 71°

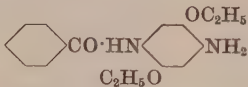
| | | |
|---|--------------------|---|
| Benzaldehyde, <i>p</i>-amino- | C_7H_7NO | 16605, 16610 42505 46045 |
|  | Mol. wt. 121 | |
| | m.p. 70–71° | |
| Benzaldehyde, 5-amino-2-chloro- | C_7H_6ClNO | 43840, 43845 |
|  | Mol. wt. 155.5 | |
| Benzaldehyde, <i>p</i>-[butyl(2-chloroethyl)amino]- | $C_{13}H_{18}ClNO$ | 48000 |
|  | Mol. wt. 239.5 | |
| Benzaldehyde, <i>o</i>-chloro- | C_7H_5ClO | 42025, 42100, 42140, 42150, 42155, 42170 45105, 45450 66800 |
|  | Mol. wt. 140.5 | |
| | b.p. 213–214° | |
| Benzaldehyde, <i>p</i>-chloro- | C_7H_5ClO | 42525, 42540, 42610, 42660, 42670, 42675, 42705, 42740, 43545, 43550 |
|  | Mol. wt. 140.5 | |
| | m.p. 47.5° | |
| Benzaldehyde, 2-chloro-4-diethylamino- | $C_{11}H_{14}ClNO$ | 42605, 43570 |
|  | Mol. wt. 211.5 | |
| Benzaldehyde, <i>p</i>-[(2-chloroethyl)methylamino]- | $C_{10}H_{12}ClNO$ | 48015 |
|  | Mol. wt. 197.5 | |
| Benzaldehyde, 2-chloro-4-nitro- | $C_7H_4ClNO_3$ | 43835 |
|  | Mol. wt. 185.5 | |
| | m.p. 80° | |
| Benzaldehyde, 2-chloro-5-nitro- | $C_7H_4ClNO_3$ | 42115, 43835 |
|  | Mol. wt. 185.5 | |
| | m.p. 80° | |
| Benzaldehyde, 2-chloro-6-nitro- | $C_7H_4ClNO_3$ | 73025 |
|  | Mol. wt. 185.5 | |
| Benzaldehyde, 2,5-dichloro- | $C_7H_4Cl_2O$ | 42030, 42105, 42130, 42135 |
|  | Mol. wt. 175 | |
| | m.p. 58° | |

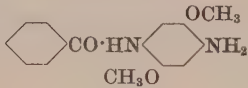
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|---|--|------------------------------|
| Benzaldehyde, 2,6-dichloro- | $C_7H_4Cl_2O$ | 43830 45455 |
|  | Mol. wt. 175 m.p. 71° | |
| Benzaldehyde, 3,5-dichloro-2-hydroxy- <i>See Salicylaldehyde, 3,5-dichloro-</i> | | |
| Benzaldehyde, 2,6-dichloro-3-methoxy- | $C_8H_6Cl_2O_2$ | 43850 |
|  | Mol. wt. 205 | |
| Benzaldehyde, 2,6-dichloro-3-nitro- | $C_7H_3Cl_2NO_3$ | 43835 |
|  | Mol. wt. 220 | |
| Benzaldehyde, p-diethylamino- | $C_{11}H_{15}NO$ | 42735, 43565 48001, 48013 |
|  | Mol. wt. 177 | |
| Benzaldehyde, p-dimethylamino- | $C_9H_{11}NO$ | 42640, 43560 |
|  | Mol. wt. 149 m.p. 73° | |
| Benzaldehyde, m-hydroxy- | $C_7H_6O_2$ | 42051, 42052, 43535 |
|  | Mol. wt. 122 m.p. 108° b.p. 240° | |
| Benzaldehyde, o-hydroxy- <i>See Salicylaldehyde</i> | | |
| Benzaldehyde, p-hydroxy- | $C_7H_6O_2$ | 42053 |
|  | Mol. wt. 122 m.p. 116° b.p. sublimes | |
| Benzaldehyde, 3-methyl-2-nitro- <i>See m-Tolualdehyde, 2-nitro-</i> | | |
| Benzaldehyde, 3-methyl-6-nitro- <i>See m-Tolualdehyde, 6-nitro-</i> | | |
| Benzaldehyde, p-(N-methyl-p-phenetidino)- | $C_{16}H_{17}NO_2$ | 48005, 48025, 48030 |
|  | Mol. wt. 255 | |

| | | |
|--|--------------------|---|
| Benzaldehyde, <i>m</i>-nitro- | $C_7H_5NO_3$ | 42021, 42038, 42046, 42047, 42050, 42051, 42110 |
|  | Mol. wt. 151 | |
| | m.p. 58° | |
| Benzaldehyde, <i>o</i>-nitro- | $C_7H_5NO_3$ | 73000, 73005 |
|  | Mol. wt. 151 | |
| | m.p. 46° | |
| Benzaldehyde, <i>o</i>-sulfo- | | |
| <i>See Benzenesulfonic acid, o-formyl-</i> | | |
| Benzaldehyde, 2,3,6-trichloro- | $C_7H_3Cl_3O$ | 43855 |
|  | Mol. wt. 209.5 | |
| | m.p. 86–87° | |
| Benzamide | C_7H_7NO | 61650 |
|  | Mol. wt. 121 | |
| | m.p. 130° | |
| Benzamide, <i>m</i>-amino-<i>N</i>-butyl- | $C_{11}H_{16}N_2O$ | 12445 |
| $C_4H_9 \cdot HN \cdot OC$  | Mol. wt. 192 | |
| Benzamide, <i>p</i>-amino-<i>N</i>-ethyl-<i>N</i>-1-naphthyl- | $C_{19}H_{18}N_2O$ | 17995 |
|  | Mol. wt. 290 | |

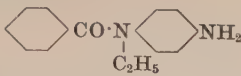



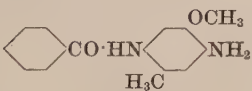
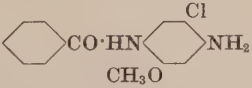
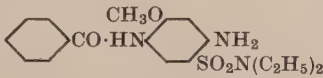

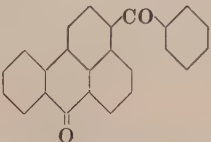
| | | |
|---|--------------------|-------|
| Benzamide, <i>N</i>-(7-hydroxy-1-naphthyl)- | $C_{17}H_{13}NO_2$ | 18180 |
|  | Mol. wt. 263 | |

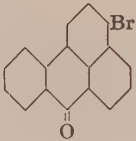
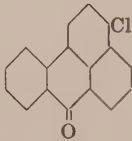
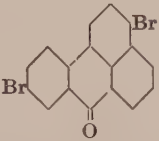
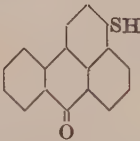
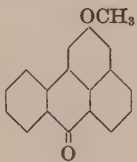
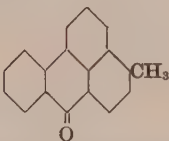
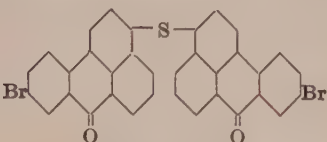
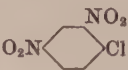
| | | |
|--|--|--|
| Benzanilide, 4'-amino-5'-chloro-2'-methoxy- | | |
| <i>See o</i> -Benzanisidide, 4'-amino-5'-chloro- | | |



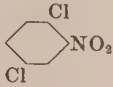
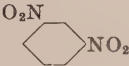

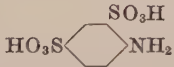
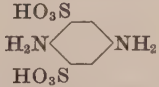
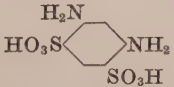
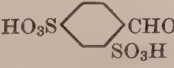
| | | |
|---|----------------------|-------|
| Benzanilide, 4'-amino-2',5'-diethoxy- | $C_{17}H_{20}N_2O_3$ | 37175 |
|  | Mol. wt. 300 | |

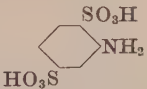

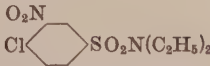
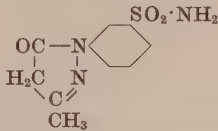
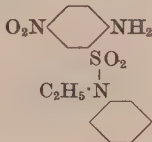

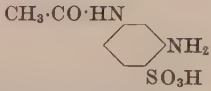
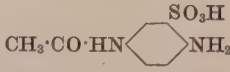
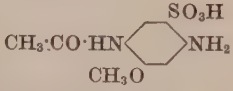
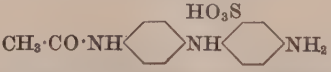
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|---|----------------------|-----------------------|
| Benzanilide, 4'-amino-2',5'-dimethoxy- | $C_{14}H_{14}N_2O_2$ | 12321 37155, 37614 |
|  | Mol. wt. 242 | |

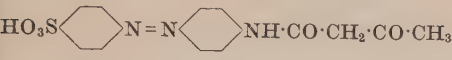
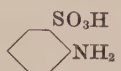
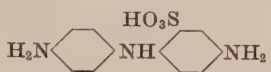
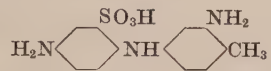
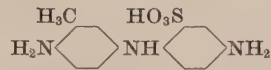

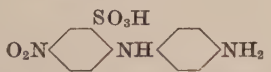
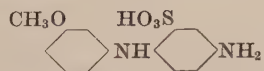
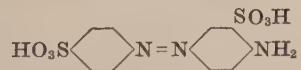
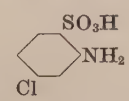

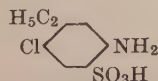
| | | |
|--|--|--|
| Benzanilide, 5'-amino-2',4'-dimethyl- | | |
| <i>See</i> 2,4-Benzoxylidide, 5'-amino- | | |

| | | |
|---|------------------------|---|
| Benzanilide, 4'-amino-<i>N</i>-ethyl- | $C_{15}H_{16}N_2O$ | 17920 |
|  | Mol. wt. 240 | |
| Benzanilide, 3-amino-4-methoxy- | | |
| <i>See p</i> -Anisanilide, 3-amino- | | |
| Benzanilide, 4'-amino-5'-methoxy-2'-methyl- | | |
| <i>See m</i> -Benzanisidide, 4'-amino-6'-methyl- | | |
| Benzanilide, 4'-amino-4-nitro- | $C_{13}H_{11}N_3O_3$ | 25240 |
|  | Mol. wt. 257 | |
| Benzanilide, 3,3'-diamino- | $C_{13}H_{13}N_3O$ | 25200 |
|  | Mol. wt. 227 | |
| Benzanilide, 4,4'-diamino- | $C_{13}H_{13}N_3O$ | 25210, 25215, 25220, 25225, 25240 32025, 32030, 32035, 32040 |
|  | Mol. wt. 227 | |
| <i>m</i>-Benzanisidide, 4'-amino-6'-methyl- | $C_{15}H_{16}N_2O_2$ | 37165 |
|  | Mol. wt. 256 | |
| <i>o</i>-Benzanisidide, 4'-amino-5'-chloro- | $C_{14}H_{13}ClN_2O_2$ | 37160 |
|  | Mol. wt. 276.5 | |
| <i>o</i>-Benzanisidide, 4'-amino-5'-diethylsulfamoyl- | $C_{18}H_{23}N_3O_4S$ | 37161 |
|  | Mol. wt. 377 | |
| Benzanthrone | $C_{17}H_{10}O$ | 59800, 59860, 60000 |
|  | Mol. wt. 230 | |
| | m.p. 170° | |
| Benzanthrone, 3-benzoyl- | $C_{24}H_{14}O_2$ | 59100, 59101, 59105, 59106, 59110 |
|  | Mol. wt. 336 | |

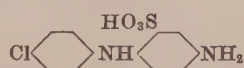
| | | |
|---|---------------------------------|--|
| Benzanthrone, 3-bromo- | <chem>C17H9BrO</chem> | 58900, 69500, 69501, 69515, 69520, 70500, 70505 |
|  | Mol. wt. 309 m.p. 170° | |
| Benzanthrone, 3-chloro- | <chem>C17H9ClO</chem> | 60000 |
|  | Mol. wt. 264.5 m.p. 191–192° | |
| Benzanthrone, 3,9-dibromo- | <chem>C17H8Br2O</chem> | 69505, 69510, 69511, 69525, 69526, 69530, 69535, 71000, 71001 |
|  | Mol. wt. 388 m.p. 256–257° | |
| Benzanthrone, 3-mercapto- | <chem>C17H10OS</chem> | 70305, 70306, 70310, 70311 |
|  | Mol. wt. 262 | |
| Benzanthrone, 2-methoxy- | <chem>C18H12O2</chem> | 59825, 59826 |
|  | Mol. wt. 260 m.p. 171–173° | |
| Benzanthrone, 4-methyl- | <chem>C18H14O</chem> | 70305, 70306, 70310, 70311 |
|  | Mol. wt. 244 m.p. 199° | |
| Benzanthrone, 3,3'-thiobis[9-bromo- | <chem>C34H18Br2O2S</chem> | 60020 |
|  | Mol. wt. 648 | |
| Benzene, 2-chloro-1,3-dihydroxy- <i>See Resorcinol, 2-chloro-</i> | | |
| Benzene, 1-chloro-2,4-dinitro- | <chem>C6H3ClN2O4</chem> | 10340, 10345, 10360, 10375, 10385 13100 20496 42021, 42050 53080 |
|  | Mol. wt. 202.5 b.p. 315° | |

| | | | |
|---|---|---|---------------------------------------|
| Benzene, 1-chloro-2-nitro- |  | $C_6H_4ClNO_2$ Mol. wt. 157.5 m.p. 32.5° | 10335, 10336, 10365 |
| Benzene, 1-chloro-2,4,6-trinitro- | <i>See Picryl chloride</i> | | |
| Benzene, o-dichloro- |  | $C_6H_4Cl_2$ Mol. wt. 147 m.p. -2° b.p. 180.3° | 45180 51320, 51325 |
| Benzene, 1,4-dichloro-2-nitro- |  | $C_6H_3Cl_2NO_2$ Mol. wt. 192 m.p. 56° b.p. 267° | 10348, 10350 |
| Benzene, m-dinitro- |  | $C_6H_4N_2O_4$ Mol. wt. 168 m.p. 89.57° b.p. 302.8° (770 mm.) | 53005, 53006 |
| Benzene, nitro- |  | $C_6H_5NO_2$ Mol. wt. 123 m.p. 5.7° b.p. 210.85° | 42500, 42510 50415 73100 |
| Benzene, 1-nitro-2-(nitromethyl)- | <i>See Toluene, o,α-dinitro-</i> | | |
| Benzene, 1,2,3-trihydroxy- | <i>See Pyrogallol</i> | | |
| m-Benzenedisulfonic acid, 4-amino- |  | $C_6H_7NO_6S_2$ Mol. wt. 253 | 14275 26340 30050 |
| m-Benzenedisulfonic acid, 2,5-diamino- |  | $C_6H_8N_2O_6S_2$ Mol. wt. 268 | 14050 |
| m-Benzenedisulfonic acid, 4,6-diamino- |  | $C_6H_8N_2O_6S_2$ Mol. wt. 268 | 13270 22060, 23000, 23370 36220 |
| m-Benzenedisulfonic acid, 4-formyl- |  | $C_7H_6O_7S_2$ Mol. wt. 266 | 42045, 42120, 42135, 42136, 42080 |

| | | |
|---|-------------------------|--|
| <i>p</i>-Benzenedisulfonic acid, 2-amino- | $C_6H_7NO_6S_2$ | 15515, 19170 28415 30380, 34025, 34130, 34200, 34205, 34230 35860 |
|  | Mol. wt. 253 | |
| Benzenesulfonamide, <i>p</i>-(benzylidenehydrazino)- | $C_{13}H_{13}N_3O_2S$ | 13710 |
|  | Mol. wt. 275 | |
| Benzenesulfonamide, 4-chloro-<i>N,N</i>-diethyl-3-nitro- | $C_{10}H_{13}ClN_2O_4S$ | 10405 |
|  | Mol. wt. 292.5 | |
| Benzenesulfonamide, <i>m</i>-(3-methyl-5-oxo-2-pyrazolin-1-yl)- | $C_{10}H_{11}N_3O_3S$ | 18870, 18875, 18880 |
|  | Mol. wt. 253 | |
| Benzenesulfonanilide, 2-amino-<i>N</i>-ethyl-5-nitro- | $C_{14}H_{15}N_3O_4S$ | 17055, 17060, 17065, 17540 |
|  | Mol. wt. 321 | |
| Benzenesulfonanilide, 4-chloro-<i>N</i>-methyl-3-nitro- | $C_{13}H_{11}ClN_2O_4S$ | 10400 |
|  | Mol. wt. 326.5 | |
| Benzenesulfonanilide, 2,5-diamino-<i>N</i>-ethyl- | $C_{14}H_{17}N_3O_2S$ | For derived dyes <i>see</i> Benzenesulfonanilide, 2-amino- <i>N</i> -ethyl-5-nitro- |
| | Mol. wt. 291 | |
| Benzenesulfonic acid, 4-acetamido-2-amino- | $C_8H_{10}N_2O_4S$ | 17035 |
|  | Mol. wt. 230 | |
| Benzenesulfonic acid, 5-acetamido-2-amino- | $C_8H_{10}N_2O_4S$ | 17045, 17910, 27066, 28430 34295 |
|  | Mol. wt. 230 | |
| Benzenesulfonic acid, 5-acetamido-2-amino-4-methoxy- | $C_9H_{13}N_2O_6S$ | 25400 |
|  | Mol. wt. 260 | |
| Benzenesulfonic acid, 2-(<i>p</i>-acetamidoanilino)-5-amino- | $C_{14}H_{15}N_3O_4S$ | 10405 |
|  | Mol. wt. 321 | |

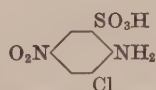
| | | |
|---|-------------------------|--|
| Benzenesulfonic acid, <i>p</i>-(<i>p</i>-acetoacetamidophenylazo)- | $C_{16}H_{15}N_3O_5S$ | 35120 |
|  | Mol. wt. 361 | |
| Benzenesulfonic acid, <i>o</i>-amino- | $C_6H_7NO_3S$ | 17020, 17750, 17865, 17907, 17910, 18155, 18156, 18158, 18159, 18972, 19070, 19120, 19135 26440, 27760, 28490 |
|  | Mol. wt. 173 | |
| Benzenesulfonic acid, 5-amino-2-(<i>p</i>-aminoanilino)- | $C_{12}H_{13}N_3O_3S$ | 32010 35430, 35435, 35440, 35445, 35450, 35460, 35465, 35545 |
|  | Mol. wt. 280 | |
| Benzenesulfonic acid, 5-amino-2-(3-amino-<i>p</i>-toluidino)- | $C_{13}H_{15}N_3O_3S$ | 76130 |
|  | Mol. wt. 293 | |
| Benzenesulfonic acid, 5-amino-2-(4-amino-<i>m</i>-toluidino)- | $C_{13}H_{15}N_3O_3S$ | 50330 |
|  | Mol. wt. 293 | |
| Benzenesulfonic acid, 5-amino-2-anilino- | $C_{12}H_{12}N_2O_3S$ | 10385, 10395, 10400, 10410, 18245 20175, 26690, 26995, 27070, 27235 50315 51300 |
|  | Mol. wt. 264 | |
| Benzenesulfonic acid, 2-(<i>p</i>-aminoanilino)-5-nitro- | $C_{12}H_{11}N_3O_5S$ | 14170, 14260 26550 |
|  | Mol. wt. 309 | |
| Benzenesulfonic acid, 5-amino-2-<i>m</i>-anisidino- | $C_{13}H_{14}N_2O_4S$ | 50320 |
|  | Mol. wt. 294 | |
| Benzenesulfonic acid, 6-amino-3,4'-azodi- | $C_{12}H_{11}N_3O_6S_2$ | 26435, 26440, 26905, 27160, 27195, 27310, 27311, 28410, 28420, 28690 35780, 36020, 36200 |
|  | Mol. wt. 337 | |
| Benzenesulfonic acid, 2-amino-4-chloro- | $C_6H_6ClNO_3S$ | 15520, 19325 |
|  | Mol. wt. 207.5 | |
| Benzenesulfonic acid, 2-amino-5-chloro- | $C_6H_6ClNO_3S$ | 27600, 28105, 28110, 26720, 28725 |
|  | Mol. wt. 207.5 | |
| Benzenesulfonic acid, 2-amino-5-chloro-4-ethyl- | $C_8H_{10}ClNO_3S$ | 15602, 15867 |
|  | Mol. wt. 203.5 | |

Benzenesulfonic acid, 5-amino-2-(*p*-chloroanilino)- $C_{12}H_{11}ClN_2O_3S$ 51305



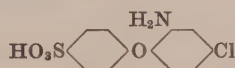
Mol. wt. 298.5

Benzenesulfonic acid, 2-amino-3-chloro-5-nitro- $C_6H_5ClN_2O_5S$ 15555



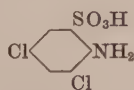
Mol. wt. 252.5

Benzenesulfonic acid, *p*-(2-amino-4-chlorophenoxy)- $C_{12}H_{10}ClNO_4S$ 17610



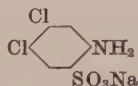
Mol. wt. 299.5

Benzenesulfonic acid, 2-amino-3,5-dichloro- $C_6H_5Cl_2NO_3S$ 28370
35785



Mol. wt. 242

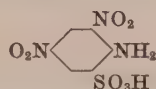
Benzenesulfonic acid, 2-amino-4,5-dichloro- $C_6H_5Cl_2NO_3S$ 15530



Mol. wt. 242

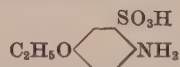
Benzenesulfonic acid, 4-amino-2,5-dichloro-
See Sulfanilic acid, 2,5-dichloro-

Benzenesulfonic acid, 2-amino-3,5-dinitro- $C_6H_5N_3O_7S$ 13460, 15840



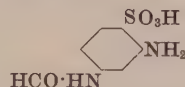
Mol. wt. 263

Benzenesulfonic acid, 2-amino-5-ethoxy- $C_8H_{11}NO_4S$ 15610



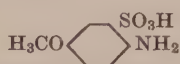
Mol. wt. 217

Benzenesulfonic acid, 2-amino-4-formamido- $C_7H_9N_2O_4S$ 29080



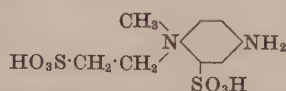
Mol. wt. 216

Benzenesulfonic acid, 2-amino-5-methoxy- $C_7H_9NO_4S$ 17908



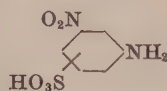
Mol. wt. 203

Benzenesulfonic acid, 5-amino-2-[methyl(2-sulfoethyl)amino]- $C_9H_{14}N_2O_6S_2$ 13210

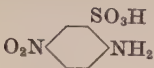



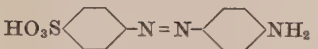
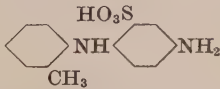
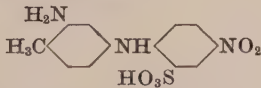
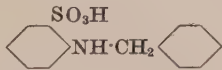
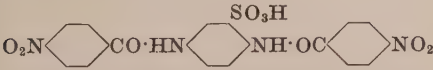
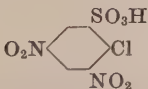
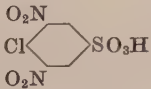


Mol. wt. 310

Benzenesulfonic acid, aminonitro- $C_6H_6N_2O_5S$ 17205



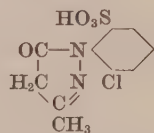
Mol. wt. 218

| | | | |
|---|---|---------------------------------------|---|
| Benzenesulfonic acid, 2-amino-5-nitro- |  | $C_6H_6N_2O_5S$ Mol. wt. 218 | 13455, 13470, 14035, 15550, 17025, 17030, 18105 20180, 20280, 20490, 21620, 25380, 27890, 27895, 27960, 27990, 28500 30195, 30200, 30205, 30275, 31670, 33565 35080, 35085, 35730, 36020 |
| Benzenesulfonic acid, 2-amino-5-(<i>p</i> -nitroanilino)- |  | $C_{12}H_{11}N_3O_5S$ Mol. wt. 309 | 50230 |
| Benzenesulfonic acid, 2-amino-5-(<i>m</i> -nitrobenzamido)- |  | $C_{13}H_{11}N_3O_6S$ Mol. wt. 337 | 19100 |
| Benzenesulfonic acid, 2-amino-5-(<i>p</i> -nitrobenzamido)- |  | $C_{13}H_{11}N_3O_6S$ Mol. wt. 337 | 17800 |
| Benzenesulfonic acid, <i>p</i> -(<i>p</i> -aminophenylazo)- |  | $C_{12}H_{11}N_3O_3S$ Mol. wt. 277 | 13100 26220, 26560, 26520, 26900, 27000, 27001, 27155, 28120, 28160, 28210, 28211, 28230, 28360, 28710 34035, 34250 35120 |
| Benzenesulfonic acid, 5-amino-2- <i>o</i> -toluidino- |  | $C_{13}H_{14}N_2O_3S$ Mol. wt. 278 | 27075 |
| Benzenesulfonic acid, 2-(3-amino- <i>p</i> -toluidino)-5-nitro- |  | $C_{13}H_{13}N_3O_6S$ Mol. wt. 323 | 13330 |
| Benzenesulfonic acid, <i>o</i> -(benzylamino)- |  | $C_{13}H_{13}NO_3S$ Mol. wt. 263 | 13140 42550 |
| Benzenesulfonic acid, 2,5-bis(<i>p</i> -nitrobenzamido)- |  | $C_{20}H_{14}N_4O_9S$ Mol. wt. 421 | 36350 |
| Benzenesulfonic acid, 2-chloro-3,5-dinitro- |  | $C_6H_3ClN_2O_7S$ Mol. wt. 282.5 | 13210 |
| Benzenesulfonic acid, 4-chloro-3,5-dinitro- |  | $C_6H_3ClN_2O_7S$ Mol. wt. 282.5 | 42551 |

Benzenesulfonic acid, 3-chloro-2-(3-methyl-5-oxo-2-pyrazolin-1-yl)-

$C_{10}H_9ClN_2O_4S$

23030

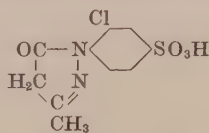


Mol. wt. 288.5

Benzenesulfonic acid, 3-chloro-4-(3-methyl-5-oxo-2-pyrazolin-1-yl)-

$C_{10}H_9ClN_2O_4S$

18915, 18920

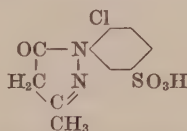


Mol. wt. 288.5

Benzenesulfonic acid, 4-chloro-3-(3-methyl-5-oxo-2-pyrazolin-1-yl)-

$C_{10}H_9ClN_2O_4S$

18890, 18895, 18900, 18910, 18930
23270

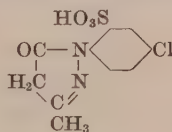


Mol. wt. 288.5

Benzenesulfonic acid, 5-chloro-2-(3-methyl-5-oxo-2-pyrazolin-1-yl)-

$C_{10}H_9ClN_2O_4S$

18950

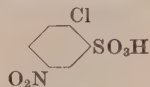


Mol. wt. 288.5

Benzenesulfonic acid, 2-chloro-5-nitro-

$C_6H_4ClNO_5S$

10415

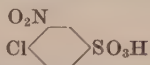


Mol. wt. 237.5

Benzenesulfonic acid, 4-chloro-3-nitro-

$C_6H_4ClNO_5S$

10445

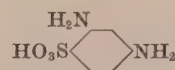


Mol. wt. 237.5

Benzenesulfonic acid, 2,4-diamino-

$C_8H_8N_2O_3S$

13250, 13255, 13260, 13265
20130, 23080, 23360, 23365, 23370, 25260, 25265, 26260
30095, 31500, 31505, 31515
35020, 35025, 35030, 35240



Mol. wt. 402

Introduced indirectly:
18971, 18972

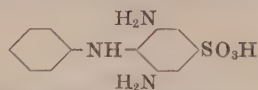
Benzenesulfonic acid, 2,5-diamino-

See dyes from Benzenesulfonic acid, 2-amino-5-nitro-

Benzenesulfonic acid, 3,5-diamino-4-anilino-

$C_{12}H_{13}N_3O_3S$

10430

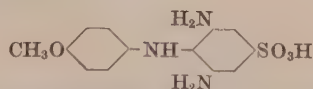


Mol. wt. 279

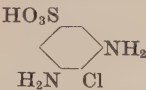
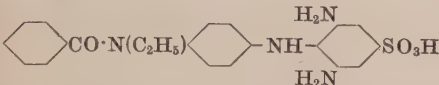
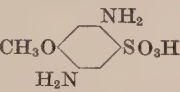
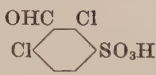
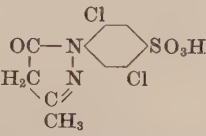
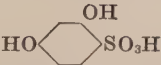

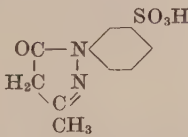
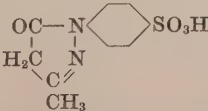
Benzenesulfonic acid, 3,5-diamino-4-p-anisidino-

$C_{13}H_{15}N_3O_4S$

10435



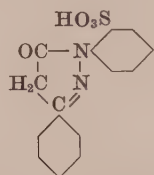
Mol. wt. 309

| | | |
|---|------------------------|--|
| Benzenesulfonic acid, 3,5-diamino-4-chloro- | $C_6H_7ClN_2O_3S$ | 13290 21720, 21725 30100, 30105 |
|  | Mol. wt. 222.5 | |
| Benzenesulfonic acid, 3,5-diamino-4-[p-(N-ethylbenzamido)anilino]- | $C_{21}H_{22}N_4O_4S$ | 10440 |
|  | Mol. wt. 426 | |
| Benzenesulfonic acid, 2,5-diamino-4-methoxy- | $C_7H_{10}N_2O_4S$ | 50325 |
|  | Mol. wt. 218 | |
| Benzenesulfonic acid, 2,4-dichloro-3-formyl- | $C_7H_4Cl_2O_4S$ | 43825 |
|  | Mol. wt. 255 | |
| Benzenesulfonic acid, 2,5-dichloro-4-(3-methyl-5-oxo-2-pyrazolin-1-yl)- | $C_{10}H_8Cl_2N_2O_4S$ | 18960, 18961, 18965, 18969, 18970, 18971, 18972 |
|  | Mol. wt. 323 | |
| Benzenesulfonic acid, 2,4-dihydroxy- | $C_6H_6O_5S$ | 14330 20281 45300 |
|  | Mol. wt. 191 | |
| Benzenesulfonic acid, 2,4-dimethyl- | | |
| <i>See 2,4-Xylenesulfonic acid</i> | | |
| Benzenesulfonic acid, p-(2,4-dinitroanilino)- | | |
| <i>See Sulfanilic acid, N-(2,4-dinitrophenyl)-</i> | | |
| Benzenesulfonic acid, o-formyl- | $C_7H_6O_4S$ | 42090, 42145, 42165, 43820 45095 |
|  | Mol. wt. 186 | |
| Benzenesulfonic acid, m-(3-methyl-5-oxo-2-pyrazolin-1-yl)- | $C_{10}H_{10}N_2O_4S$ | 18800, 18805, 18810 22380, 25345 |
|  | Mol. wt. 254 | |
| Benzenesulfonic acid, p-(3-methyl-5-oxo-2-pyrazolin-1-yl)- | $C_{10}H_{10}N_2O_4S$ | 14870, 18820, 18821, 18830, 18835, 18840, 18841, 18845, 18850, 18852, 18855 22375, 22430, 22870, 23655, 23665, 24820, 25250, 28680 |
|  | Mol. wt. 254 | |

Benzenesulfonic acid, o-(5-oxo-3-phenyl-2-pyrazolin-1-yl)-

$C_{16}H_{13}N_2O_4S$

19110, 19115

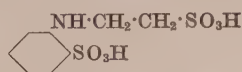


Mol. wt. 316

Benzenesulfonic acid, o-(2-sulfoethylamino)-

$C_8H_{11}NO_3S_2$

42545

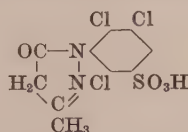


Mol. wt. 281

Benzenesulfonic acid, 2,4,5-trichloro-3-(3-methyl-5-oxo-2-pyrazolin-1-yl)-

$C_{10}H_7Cl_3N_2O_4S$

18980

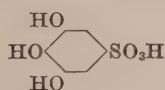


Mol. wt. 357.5

Benzenesulfonic acid, 3,4,5-trihydroxy-

$C_6H_6O_6S$

51110



Mol. wt. 206

Benzenesulfonic acid, 5,5'-ureylenebis[2-amino-

$C_{13}H_{14}N_4O_7S_2$

25370, 25375, 25380, 25385
35120



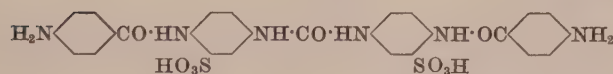
Mol. wt. 378

Benzenesulfonic acid, 5,5'-ureylenebis[2-(p-aminobenzamido)-

$C_{27}H_{24}N_6O_9S_2$

25430, 25435, 25440
36910

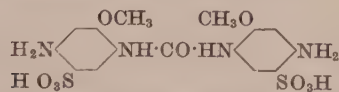
Mol. wt. 640



Benzenesulfonic acid, 5,5'-ureylenebis[2-amino-4-methoxy-

$C_{15}H_{18}N_4O_9S_2$

25400, 25405

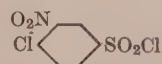


Mol. wt. 462

Benzenesulfonyl chloride, 4-chloro-3-nitro-

$C_6H_3Cl_2NO_4S$

10338

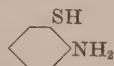


Mol. wt. 256

Benzenethiol, o-amino-


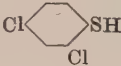
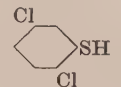
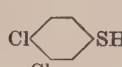
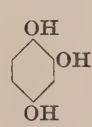
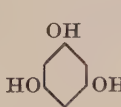
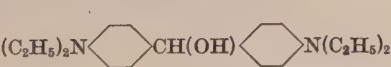


C_6H_7NS

49015



Mol. wt. 125

m.p. 26°

| | | | |
|---|---|--------------------|--|
| Benzenethiol, <i>p</i>-chloro- |  | C_6H_5ClS | 68600 |
| | | Mol. wt. 144.5 | |
| | | m.p. 54° | |
| Benzenethiol, 2,4-dichloro- |  | $C_6H_4Cl_2S$ | 68605 |
| | | Mol. wt. 179 | |
| Benzenethiol, 2,5-dichloro- |  | $C_6H_4Cl_2S$ | 68610 |
| | | Mol. wt. 179 | |
| Benzenethiol, 3,4-dichloro- |  | $C_6H_4Cl_2S$ | 68615 |
| | | Mol. wt. 179 | |
| 1,2,4-Benzenetriol |  | $C_6H_6O_3$ | 58205 |
| | | Mol. wt. 126 | |
| | | m.p. 140.5° | |
| 1,3,5-Benzenetriol |  | $C_6H_6O_3$ | C.I. Developer 19 |
| | | Mol. wt. 126 | |
| Benzhydrol, 4,4'-bis(diethylamino)- |  | $C_{21}H_{30}N_2O$ | 42037, 42055, 44025 |
| | | Mol. wt. 326 | |
| Benzhydrol, 4,4'-bis(dimethylamino)- |  | $C_{17}H_{22}N_2O$ | 42005, 42010, 42015, 42036, 42545, 42550, 42551, 42555, 42557, 45560, 42562, 42565, 42570, 42571, 42575, 42580, 42581, 43500, 43505, 44010, 44015, 44020, 44025, 44030, 44035, 44040, 44045, 44090 |
| | | Mol. wt. 270 | 51200 |
| | | m.p. 96° | |
| Benzhydrol, 3,3'-dimethyl-4,4'-bis(methylamino)- |  | $C_{17}H_{22}N_2O$ | 44520 |
| | | Mol. wt. 270 | |

Benzidine

10311



Mol. wt. 184

m.p. 128°

14085, 14135

21060, 21080, 22000, 22010, 22020, 22030, 22035, 22040, 22045,
 22046, 22050, 22060, 22070, 22080, 22090, 22095, 22100,
 22110, 22120, 22125, 22130, 22135, 22140, 22145, 22150,
 22155, 22160, 22165, 22170, 22175, 22180, 22190, 22195,
 22200, 22205, 22210, 22220, 22230, 22238, 22240, 22245,
 22250, 22255, 22260, 22270, 22275, 22280, 22285, 22290,
 22300, 22305, 22306, 22310, 22311, 22315, 22320, 22325,
 22330, 22335, 22340, 22345, 22360, 22370, 22375, 22380,
 22385, 22390, 22400, 22405, 22410, 22415, 22420, 22430,
 22440, 22445, 22450, 22455, 22460, 22465, 22470, 22475,
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 22580, 22585, 22590, 22595, 22600, 22605, 22610, 22620,
 22625, 22630, 22640
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 30165, 30170, 30175, 30180, 30185, 30190, 30195, 30200,
 30205, 30210, 30215, 30220, 30225, 30230, 30235, 30240,
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 30285, 30290, 30295, 30300, 30305, 30310, 30315, 30325,
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 31685, 31690, 31695, 31700, 31705, 31710, 31715, 31720,
 31725, 31730, 31735, 31740, 31745, 31750, 31755, 31760,
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 31845, 31850, 31855
 35060, 35065, 35070, 35075, 35080, 35085, 35210, 35220, 35240,
 35400, 35415, 35520, 35530, 35535, 35650, 35660, 35700,
 35710, 35715, 35720, 35900, 36030, 36040, 36210, 36300
 37225
 53025, 53105, 53115, 53120, 53121, 53125, 53135, 53145, 53150,
 53160, 53161, 53590
 66510, 66515, 70695
 76106

Benzidine, 2,2'-dichloro-

23000, 23005, 23010, 23015, 23030



Mol. wt. 253

m.p. 167°

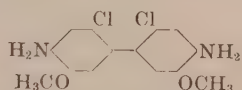
Benzidine, 3,3'-dichloro-21090, 21091, 21095, 21096, 21100, 21105, 21110, 21115, 21120,
23040, 23045, 23050, 23070

Mol. wt. 253

m.p. 133°

Benzidine, 2,2'-dichloro-5,5'-dimethoxy-

21220



Mol. wt. 313

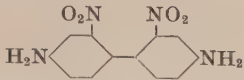

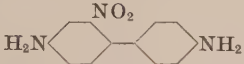
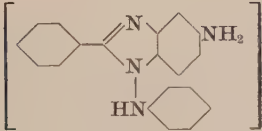
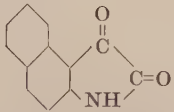
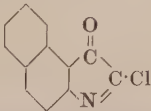
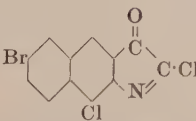
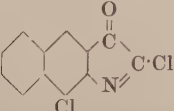
Benzidine, 3,3'-dihydroxy-*See m,m'*-Biphenol, 6,6'-diamino-**Benzidine, 3,3'-dimethoxy-**

21160, 21165, 21180, 21185, 21200, 21205, 21210, 23150, 23155,
 23160, 24050, 24060, 24065, 24070, 24075, 24080, 24090,
 24100, 24105, 24110, 24115, 24120, 24125, 24130, 24140,
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 24350, 24355, 24360, 24361, 24365, 24370, 24375, 24380,
 24385, 24390, 24395, 24400, 24405, 24410, 24411, 24415,
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 31960, 31965, 31970
 35110, 35680, 35730, 37235, 37575



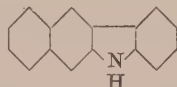
Mol. wt. 244

m.p. 137-138°

| | | |
|---|------------------------------------|---|
| Benzidine, 2,2'-dinitro- | $C_{12}H_{10}N_4O_4$ | 23130 |
|  | Mol. wt. 274 | |
| | m.p. 214° | |
| Benzidine, 2,2'-disulfo- | | |
| <i>See 2,2'-Biphenyldisulfonic acid, 4,4'-diamino-</i> | | |
| Benzidine, 3-ethoxy- | $C_{14}H_{16}N_2O$ | 24000, 24010, 24020, 24025, 24030, 24040 |
|  | Mol. wt. 228 | |
| Benzidine, 2-nitro- | $C_{12}H_{11}N_3O_2$ | 23080, 23090, 23091, 23095, 23100, 23105, 23110 |
|  | Mol. wt. 229 | |
| | m.p. 143° | |
| Benzidine, 3-sulfo- | | |
| <i>See 3-Biphenylsulfonic acid, 4,4'-diamino-</i> | | |
| Benzidine-3,3'-disulfonic acid | | |
| <i>See 3,3'-Biphenyldisulfonic acid, 4,4'-diamino-</i> | | |
| Benzimidazole, 5-amino-1-anilino-2-phenyl-, di(and tri)sulfonated | $C_{19}H_{16}N_4O_6S_2$ (disulfo) | 14150 |
| | Mol. wt. 460 | |
|  | $C_{19}H_{16}N_4O_9S_3$ (trisulfo) | |
| | Mol. wt. 540 | |
| | $(SO_3Na)_{2-3}$ | |
| 3H-Benz[e]indole-1,2-dione | $C_{12}H_7NO_2$ | 73110, 73811 |
|  | Mol. wt. 197 | |
| | m.p. 252° | |
| 1H-Benz[e]indol-1-one, 2-chloro- | $C_{12}H_6ClNO$ | 73811, 73850 |
|  | Mol. wt. 215.5 | |
| 3H-Benz[f]indol-3-one, 6-bromo-2,9-dichloro- | $C_{12}H_4BrCl_2NO$ | 73840 |
|  | Mol. wt. 329 | |
| 3H-Benz[f]indol-3-one, 2,9-dichloro- | $C_{12}H_5Cl_2NO$ | 73835 |
|  | Mol. wt. 250 | |

5H-Benzo[b]carbazole $C_{16}H_{11}N$

56070

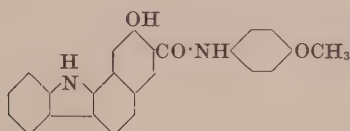


Mol. wt. 217

m.p. 330°

**11H-Benzo[a]carbazole-3-carboxanilide,
2-hydroxy-4'-methoxy-2'-methyl-***See* 11H-Benzo[a]carbazole-3-carbox-*p*-anisidide,
2-hydroxy-2'-methyl-**11H-Benzo[a]carbazole-3-carbox-*p*-anisidide,
2-hydroxy-** $C_{24}H_{18}N_2O_3$

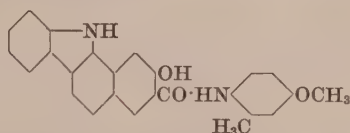
37595



Mol. wt. 382

**11H-Benzo[a]carbazole-3-carbox-*p*-anisidide,
2-hydroxy-2'-methyl-** $C_{26}H_{20}N_2O_3$

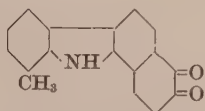
37590



Mol. wt. 396

11H-Benzo[a]carbazole-3,4-dione, 10-methyl- $C_{17}H_{11}NO_2$

73830

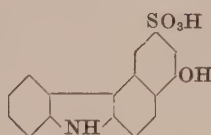


Mol. wt. 261

m.p. 206°

**7H-Benzo[c]carbazole-2-sulfonic acid,
4-hydroxy-** $C_{16}H_{11}NO_4S$

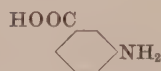
19610



Mol. wt. 305

Benzoic acid $C_7H_6O_2$ 42005, 42760, 42775, 42795, 42800
50435, 57005
58200, 60515

Mol. wt. 122

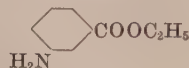
m.p. 121-122°
b.p. 249°**Benzoic acid, *m*-amino-** $C_7H_7NO_2$ 13060, 13200, 14000, 15505
29035, 29155, 29170
35000
62145

Mol. wt. 137

m.p. 174°


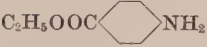
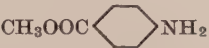

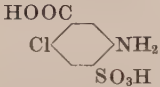
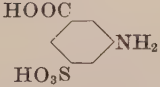
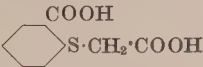
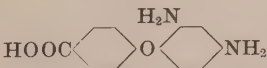
Benzoic acid, *m*-amino-, ethyl ester $C_9H_{11}NO_2$

62145



Mol. wt. 165

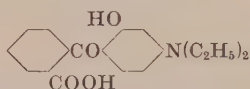
b.p. 294°

| | | |
|---|----------------------|----------------|
| Benzoic acid, <i>p</i>-amino- | $C_7H_7NO_2$ | 29156 67820 |
|  | Mol. wt. 137 | |
| | m.p. 186–187° | |
| Benzoic acid, <i>p</i>-amino-, ethyl ester | $C_9H_{11}NO_2$ | 16535 |
|  | Mol. wt. 165 | |
| Benzoic acid, <i>p</i>-amino-, methyl ester | $C_8H_9NO_2$ | 12712 |
|  | Mol. wt. 151 | |
| Benzoic acid, 5-amino-2-benzoyl-4-methyl- <i>See p</i> -Toluic acid, 5-amino-2-benzoyl- | | |
| Benzoic acid, 2-amino-4-chloro- <i>See</i> Anthranilic acid, 4-chloro- | | |
| Benzoic acid, 5-amino-2-chloro- | $C_7H_6ClNO_2$ | 14130 |
|  | Mol. wt. 171.5 | |
| Benzoic acid, 5-amino-2-chloro-4-sulfo- | $C_7H_6ClNO_6S$ | 15525 |
|  | Mol. wt. 257.5 | |
| Benzoic acid, 2-amino-3,5-dichloro- <i>See</i> Anthranilic acid, 3,5-dichloro- | | |
| Benzoic acid, 3-amino-4-methoxy- <i>See p</i> -Anisic acid, 3-amino- | | |
| Benzoic acid, 3-amino-5-sulfo- | $C_7H_7NO_6S$ | 29045 |
|  | Mol. wt. 217 | |
| Benzoic acid, 2-amino-4-trifluoromethyl- <i>See</i> Anthranilic acid, 4-(trifluoromethyl)- | | |
| Benzoic acid, 2-(carboxymethylamino)-3,5-dichloro- <i>See</i> Anthranilic acid, <i>N</i> -(carboxymethyl)-3,5-dichloro- | | |
| Benzoic acid, <i>o</i>-(carboxymethylmercapto)- | $C_9H_8O_4S$ | 73300 |
|  | Mol. wt. 212 | |
| | m.p. 218–219° | |
| Benzoic acid, <i>p</i>-(2,4-diaminophenoxy)- | $C_{13}H_{12}N_2O_3$ | 13305 |
|  | Mol. wt. 244 | |

Benzoic acid, o-(4-diethylamino-2-hydroxybenzoyl)-

$C_{18}H_{19}NO_4$

45166, 45215, 45305



Mol. wt. 313

Benzoic acid, 2,4-dihydroxy-

See β -Resorcylic acid

Benzoic acid, 3,5-dihydroxy-

See α -Resorcylic acid

Benzoic acid, 2,4-dihydroxy-3-methyl-

See β -Resorcylic acid, 3-methyl-

Benzoic acid, 2,4-dimethyl-6-hydroxy-

See 2,4-Xylic acid, 6-hydroxy-

Benzoic acid, o-hydroxy-

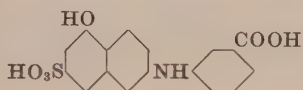
See Salicylic acid

Benzoic acid, m-(5-hydroxy-7-sulfo-2-naphthylamino)-

$C_{17}H_{13}NO_6S$

22810

31980



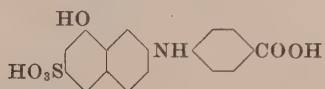
Mol. wt. 359

Benzoic acid, p-(8-hydroxy-6-sulfo-2-naphthylamino)-

$C_{17}H_{13}NO_6S$

25040

35420

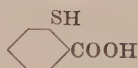


Mol. wt. 359

Benzoic acid, o-mercapto-

$C_7H_6O_2S$

73300



Mol. wt. 154

m.p. 164–165°

Benzoin

$C_{14}H_{12}O_2$

66900



Mol. wt. 212

m.p. 137°

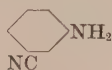
4,5-Benzoisatin

See 3H-Benz[e]indole-1,2-dione

Benzonitrile, m-amino-

$C_7H_6N_2$

62135



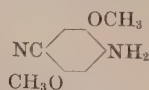
Mol. wt. 118

m.p. 53–54°

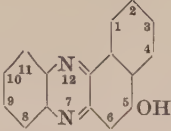



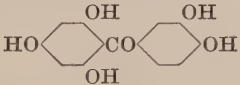
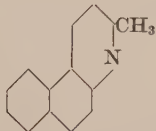
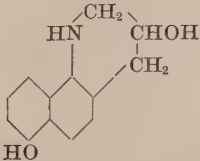
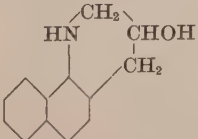
Benzonitrile, 4-amino-2,5-dimethoxy-

$C_9H_{10}N_2O_2$

37170

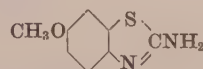


Mol. wt. 178

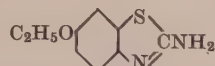
| | | |
|---|----------------------------|--|
| Benzo[a]phenazin-5-ol | $C_{18}H_{10}N_2O$ | 56075 |
|  | Mol. wt. 246 | |
| Benzophenone, 4,4'-bis(diethylamino)- | $C_{21}H_{28}N_2O$ | 42595, 42596, 42600, 42630 46080 |
| $(C_2H_5)_2N$  $N(C_2H_5)_2$ | Mol. wt. 324 | |
| | m.p. 96° | |
| Benzophenone, 4,4'-bis(dimethylamino)- | $C_{17}H_{20}N_2O$ | 41000, 42555, 42557, 42561, 42710, 43525, 44060, 44065, 44070, 44075, 46075 |
| $(CH_3)_2N$  $N(CH_3)_2$ | Mol. wt. 268 | |
| | m.p. 175° b.p. > 360° | |
| Benzophenone, 4,4'-dichloro- | $C_{13}H_8Cl_2O$ | 44505, 44510 |
|  | Mol. wt. 251 | |
| | m.p. 147-148° b.p. 353° | |
| Benzophenone, 2,3',4',6-pentahydroxy- | $C_{13}H_{10}O_6$ | 20030 |
|  | | |
| Benzophenone chloride, 4,4'-bis(diethylamino)- | | |
| <i>See Aniline, 4,4'-(dichloromethylene)bis[N,N-diethyl-</i> | | |
| Benzophenone chloride, 4,4'-bis(dimethylamino)- | | |
| <i>See Aniline, 4,4'-(dichloromethylene)bis[N,N-dimethyl-</i> | | |
| Benzo[f]quinoline, 3-methyl- | $C_{14}H_{11}N$ | 47035 |
|  | Mol. wt. 193 | |
| | m.p. 82° b.p. > 300° | |
| Benzo[h]quinoline-3,7-diol, 1,2,3,4-tetrahydro- | $C_{13}H_{13}NO_2$ | 11430, 11435 |
|  | Mol. wt. 215 | |
| Benzo[h]quinolin-3-ol, 1,2,3,4-tetrahydro- | $C_{13}H_{13}NO$ | 11420 |
|  | Mol. wt. 199 | |

p-Benzoquinone*See p-Quinone***p-Benzoquinone, 2-methyl-***See p-Toluquinone***p-Benzoquinone, 2,3,5,6-tetrachloro-***See Chloranil***Benzothiazole, 2-amino-6-methoxy-** $C_8H_8N_2OS$

11135, 11435



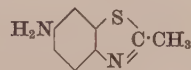
Mol. wt. 212

Benzothiazole, 2-amino-6-ethoxy- $C_9H_{10}N_2OS$ 11136
37625

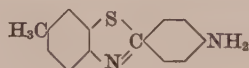
Mol. wt. 194

Benzothiazole, 6-amino-2-methyl- $C_8H_8N_2S$

48065



Mol. wt. 164

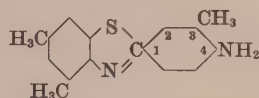
Benzothiazole, 2-(p-aminophenyl)-6-methyl- $C_{14}H_{12}N_2S$ 14930, 14985, 15030, 15075, 15080
49005, 49015
53160, 53161

Mol. wt. 240

m.p. 194–198°

**Benzothiazole,
2-(4-amino-m-tolyl)-4,6-dimethyl-** $C_{16}H_{16}N_2S$

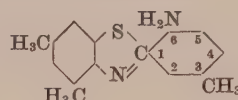
13450, 14990, 15085, 16280, 18100



Mol. wt. 268

**Benzothiazole,
2-(6-amino-m-tolyl)-4,6-dimethyl-** $C_{16}H_{16}N_2S$

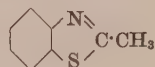
16085



Mol. wt. 268

Benzothiazole, 2-methyl- C_8H_7NS

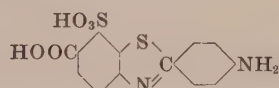
49015



Mol. wt. 149

m.p. liquid
b.p. 238°**6-Benzothiazolecarboxylic acid,
2-(p-aminophenyl)-7-sulfo-** $C_{14}H_{10}N_2O_5S_2$

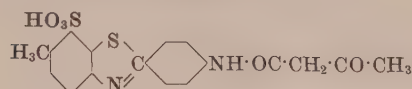
13930, 19550



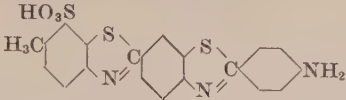
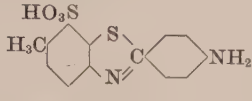
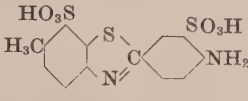
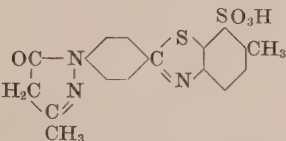
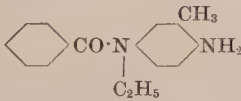
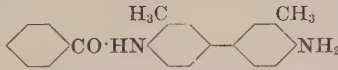
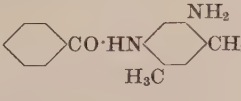
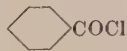
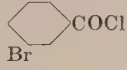
Mol. wt. 318

**7-Benzothiazolesulfonic acid,
2-(p-acetoacetamidophenyl)-6-methyl-** $C_{18}H_{16}N_2O_5S_2$

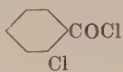
13970



Mol. wt. 404

| | | |
|--|-------------------------|---|
| 7-Benzothiazolesulfonic acid, 2-[2-(<i>p</i>-aminophenyl)-6-benzothiazolyl]-6-methyl- | $C_{21}H_{15}N_3O_3S_3$ | 13270, 13300, 13320, 13925, 14140, 14785, 16081, 17630, 18780, 18855, 19556 20100, 20130, 20210, 20216, 20220, 20230, 26510 35130 |
|  | Mol. wt. 453 | |
| 7-Benzothiazolesulfonic acid, 2-(<i>p</i>-aminophenyl)-6-methyl- | $C_{14}H_{12}N_2O_3S_2$ | 13920, 13970, 14780, 15660, 16080, 19000, 19160, 19530, 19540, 19555 20140, 20215, 20255, 22390 49005, 49010 |
|  | Mol. wt. 320 | |
| 7-Benzothiazolesulfonic acid, 2-(4-amino-3-sulfophenyl)-6-methyl- | $C_{14}H_{12}N_2O_6S_3$ | 17880 |
|  | Mol. wt. 400 | |
| 7-Benzothiazolesulfonic acid, 6-methyl-2-[<i>p</i>-(3-methyl-5-oxo-2-pyrazolin-1-yl)-phenyl]- | $C_{18}H_{15}N_3O_4S_2$ | 19100 |
|  | Mol. wt. 401 | |
| <i>m</i>-Benzotoluidide, 4'-amino-<i>N</i>-ethyl- | $C_{16}H_{18}N_2O$ | 14680 |
|  | Mol. wt. 254 | |
| <i>o</i>-Benzotoluidide, 4'-(4-amino-<i>m</i>-tolyl)- | $C_{21}H_{20}N_2O$ | 14705 |
|  | Mol. wt. 316 | |
| Benzotrichloride | | |
| <i>See</i> Toluene, <i>α,α,α</i> -trichloro- | | |
| 2,4-Benzoxylidide, 5'-amino- | $C_{15}H_{16}N_2O$ | 37180 |
|  | Mol. wt. 240 | |
| Benzoyl chloride | C_7H_5ClO | 60515, 60745, 60750, 60770, 61650, 61725, 61726, 61730, 63355, 64015, 65010, 66795, 66800, 67105, 67920, 69515, 69520 73100 |
|  | Mol. wt. 140.5 | |
| | b.p. 198.3°/749 mm. | |
| Benzoyl chloride, <i>m</i>-bromo- | C_7H_4BrClO | 61740 |
|  | Mol. wt. 219.5 | |
| | b.p. 243° | |

Benzoyl chloride, o-chloro- $C_7H_4Cl_2O$ 66700



Mol. wt. 175

b.p. 235–238°

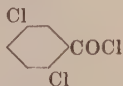
Benzoyl chloride, p-chloro- $C_7H_4Cl_2O$ 68400



Mol. wt. 175

m.p. 16°
b.p. 220–222°

Benzoyl chloride, 2,5-dichloro- $C_7H_3Cl_3O$ 68405, 68415



Mol. wt. 209.5

b.p. 137°/15 mm.

Benzoyl chloride, p-dimethylamino- $C_9H_{10}ClNO$ 42625, 42745



Mol. wt. 183.5

m.p. 141°

Benzoyl chloride, m-methoxy-

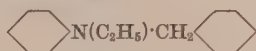
See m-Anisoyl chloride

Benzylamine, N-ethyl-N-(p-nitrosophenyl)- $C_{15}H_{16}N_2O$ 50335



Mol. wt. 240

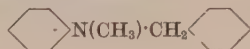
Benzylamine, N-ethyl-N-phenyl- $C_{15}H_{17}N$ 13150
42052, 42053, 42080, 42095, 42105



Mol. wt. 211

b.p. 286°/710 mm.

Benzylamine, N-methyl-N-phenyl- $C_{14}H_{15}N$ 42060, 42561, 42596



Mol. wt. 197

b.p. 305–306°

Benzyl chloride

See Toluene, α-chloro-

4',4'''-Biacetanilide, 2',2'''-dinitro- $C_{16}H_{14}N_4O_6$ 53152



Mol. wt. 358

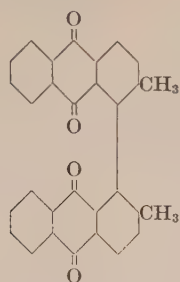
4',4'''-Bi-o-acetoacetotoluidide $C_{22}H_{24}N_2O_4$ 20040, 20045

Mol. wt. 380



1,1'-Bianthraquinone, 2,2'-dimethyl- $C_{30}H_{18}O_4$

59700, 59701

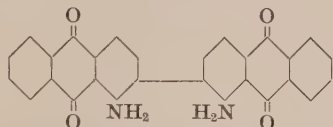


Mol. wt. 442

m.p. 366–367°

2,2'-Bianthraquinone, 1,1'-diamino- $C_{28}H_{16}N_2O_4$

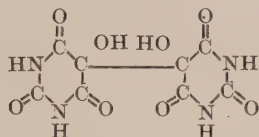
69000



Mol. wt. 444

5,5'-Bibarbituric acid, 5,5'-dihydroxy- $C_8H_6N_4O_8$

56085



Mol. wt. 286

Bibenzyl-2,2'-disulfonic acid, 4,4'-diamino- $C_{14}H_{16}N_2O_6S_2$

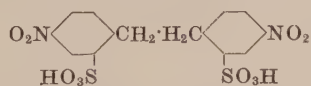
24850



Mol. wt. 372

Bibenzyl-2,2'-disulfonic acid, 4,4'-dinitro- $C_{14}H_{12}N_2O_{10}S_2$

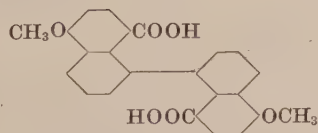
40225



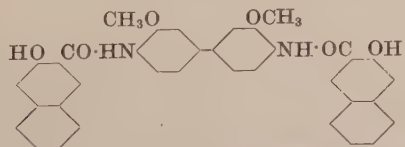
Mol. wt. 432

*See also dyes from 2,2'-Stilbenedisulfonic acid, 4,4'-dinitro-***[1,1'-Binaphthalene]-8,8'-dicarboxylic acid, 5,5'-dimethoxy-** $C_{24}H_{18}O_6$

59315



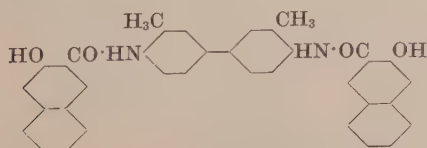
Mol. wt. 402

4',4'''-Bi-2-naphth-o-anisidide, 3,3'''-dihydroxy- $C_{36}H_{28}N_2O_6$ 29270, 29275
37575



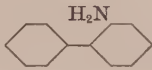


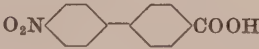
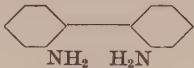
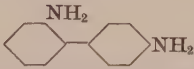


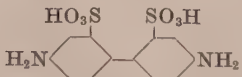
Mol. wt 584

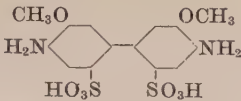
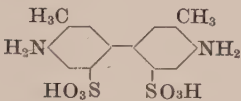




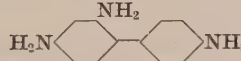
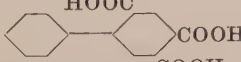
4',4'''-Bi-2-naphth-o-toluidide, 3,3'''-dihydroxy- $C_{36}H_{28}N_2O_4$

37570



Mol. wt. 552

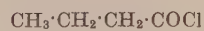
| | | |
|---|-------------------------|---|
| 1,1'-Binaphthyl, 4,4'-dibenzoyl- | $C_{34}H_{22}O_2$ | 59800 |
|  | Mol. wt. 462 | |
| <i>m,m'</i> -Biphenol, 6,6'-diamino- | $C_{12}H_{12}N_2O_2$ | 23150, 23155, 23160, 23165 |
|  | Mol. wt. 216 | |
| 2-Biphenylamine | $C_{12}H_{11}N$ | 17930 |
|  | Mol. wt. 169 | |
| 4-Biphenylamine | $C_{12}H_{11}N$ | 61595 74280 |
|  | Mol. wt. 169 | |
| | m.p. 50-52° | |
| 4-Biphenylcarboxylic acid | $C_{13}H_{10}O_2$ | 60530, 60531 |
|  | Mol. wt. 198 | |
| | m.p. 228° | |
| 4-Biphenylcarboxylic acid, 4'-nitro- | $C_{13}H_9NO_4$ | 65429, 65430 |
|  | Mol. wt. 243 | |
| | m.p. 344-346° | |
| 2,2'-Biphenyldiamine | $C_{12}H_{12}N_2$ | 70600, 70601 |
|  | Mol. wt. 184 | |
| | m.p. 81° | |
| 2,4'-Biphenyldiamine | $C_{12}H_{12}N_2$ | 21050 |
|  | Mol. wt. 184 | |
| 3,4-Biphenyldicarbonitrile | $C_{14}H_8N_2$ | 74280 |
|  | Mol. wt. 204 | |
| 3,3'-Biphenyldicarboxylic acid, 4,4'-diamino- | $C_{14}H_{12}N_2O_4$ | 22750, 22755, 22770, 22775, 22780, 22790, 22800, 22810, 22815 |
|  | Mol. wt. 272 | |
| 2,2'-Biphenyldisulfonic acid, 4,4'-diamino- | $C_{12}H_{12}N_2O_6S_2$ | 22880, 22885, 22890, 22895, 22900, 22905, 22910 31860 |
|  | Mol. wt. 344 | |

| | | |
|---|-------------------------|---|
| 2,2'-Biphenyldisulfonic acid, 4,4'-diamino-5,5'-dimethoxy- | $C_{14}H_{16}N_2O_6S_2$ | 24500 |
|  | Mol. wt. 404 | |
| 2,2'-Biphenyldisulfonic acid, 4,4'-diamino-5,5'-dimethyl- | $C_{14}H_{16}N_2O_6S_2$ | 23900, 23905, 23910 |
|  | Mol. wt. 372 | |
| 3,3'-Biphenyldisulfonic acid, 4,4'-diamino- | $C_{12}H_{12}N_2O_6S_2$ | 22920, 22930 31865, 31870 35420 |
|  | Mol. wt. 344 | |
| Biphenylene sulfone, 3,7-diamino- | | |
| <i>See 3,7-Dibenzothiophenediamine, 5,5-dioxide</i> | | |
| 4,6-Biphenylene sulfonedisulfonic acid, 3,7-diamino- | | |
| <i>See 4,6-Dibenzothiophenedisulfonic acid, 3,7-diamino-, 5,5-dioxide</i> | | |
| 3-Biphenylsulfonic acid, 4-amino- | $C_{12}H_{11}NO_3S$ | 28470 |
|  | Mol. wt. 249 | |
| 3-Biphenylsulfonic acid, 4-cyano- | $C_{13}H_9NO_3S$ | 74280 |
|  | Mol. wt. 245 | |
| 3-Biphenylsulfonic acid, 4,4'-diamino- | $C_{12}H_{12}N_2O_3S$ | 22850, 22855, 22860, 22870 30365 35410, 35600 |
|  | Mol. wt. 264 | |
| 2,4,4'-Biphenyltriamine | $C_{12}H_{13}N_3$ | 13340 |
|  | Mol. wt. 199 | |
| 2,4,5-Biphenyltricarboxylic acid | $C_{15}H_{10}O_6$ | 74320 |
|  | Mol. wt. 286 | |
| Bis(2-anthraquinonylmethyl) sulfide | | |
| <i>See Anthraquinone, 2,2'-(thiodimethylene)di-</i> | | |
| Bis(3-benzanthronyl) sulfide, 9,9'-dibromo- | | |
| <i>See Benzanthrone, 3,3'-thiobis[9-bromo-</i> | | |
| Broenner's acid | | |
| <i>See 2-Naphthalenesulfonic acid, 6-amino-</i> | | |
| 1,3-Butadiene, 2,3-dimethyl- | C_6H_{10} | 74320 |
| $CH_2:C(CH_3):C(CH_3):CH_2$ | Mol. wt. 82 | |

Butyryl chloride

 C_4H_7ClO

68410



Mol. wt. 106.5

b.p. 101–102°

C

Carbanilide, 3,3'-diamino-

 $C_{13}H_{14}N_4O$ 25260, 25265, 25270, 25275
32015, 35240

Mol. wt. 242

Carbanilide, 4,4'-diamino-

 $C_{13}H_{14}N_4O$ 25280, 25290, 25300, 25310, 25315, 25320, 25325
32020

Mol. wt. 242

Carbanilide, 4,4'-diaminothio-

 $C_{13}H_{14}N_4S$

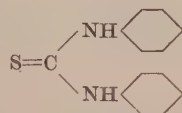
21280, 25450



Carbanilide, thio-

 $C_{13}H_{12}N_2S$

73000



Mol. wt. 228

m.p. 151°

Carbazole, 3-amino-

 $C_{12}H_{10}N_2$

51315



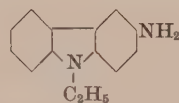
Mol. wt. 182

m.p. 253°

Carbazole, 3-amino-9-ethyl-

 $C_{14}H_{14}N_2$

51319, 51320



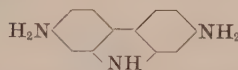
Mol. wt. 210

m.p. 127°

Carbazole, 2,7-diamino-

 $C_{12}H_{11}N_3$

25700

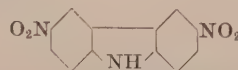


Mol. wt. 197

Carbazole, 3,6-dinitro-

 $C_{12}H_7N_3O_4$

53335

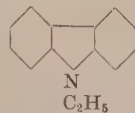


Mol. wt. 257

Carbazole, 9-ethyl-

 $C_{14}H_{13}N$

69400



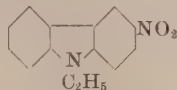
Mol. wt. 195

m.p. 67–68°

Carbazole, 9-ethyl-3-nitro-

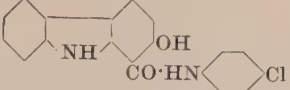
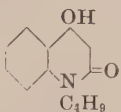
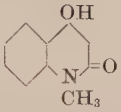
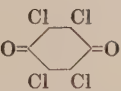
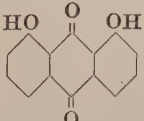
 $C_{14}H_{12}N_2O_2$

51320



Mol. wt. 240

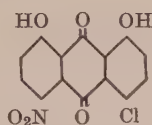
m.p. 129–130°

| | | |
|--|---|---|
| 1-Carbazolecarboxanilide, 4'-chloro-2-hydroxy-  | $C_{19}H_{13}ClN_2O_2$ | 12810, 12815, 12820, 12825 37600 |
| Carbon tetrachloride | CCl_4 | 44535 |
| | Mol. wt. 154 | |
| | m.p. -23.8° b.p. 76.7° | |
| Carbostyryl, 1-butyl-4-hydroxy-  | $C_{13}H_{15}NO_2$ | 19360 |
| | Mol. wt. 217 | |
| Carbostyryl, 4-hydroxy-1-methyl-  | $C_{10}H_9NO_2$ | 12790, 12795 |
| | Mol. wt. 175 | |
| Catechol <i>See</i> Pyrocatechol | | |
| Chicago Acid <i>See</i> 1-Naphthol-5,7-disulfonic acid, 8-amino- | | |
| Chloral $CCl_3 \cdot CHO$ Hydrate (+ H_2O) | C_2HCl_3O | 45020 |
| | Mol. wt. 147.5 | |
| | b.p. 98° | |
| Chloranil  | $C_6Cl_4O_2$ | 51300, 51305, 51310, 51315, 51319, 51320, 51325 52100 56010, 56011, 56012, 56015, 56016, 56017, 56045 |
| | Mol. wt. 246 | |
| | m.p. $292-295^\circ$ | |
| 3-Chlorophenylglycine-2-carboxylic acid, 4-bromo- <i>See</i> Anthranilic acid, 5-bromo- <i>N</i> -(carboxymethyl)-6-chloro- | | |
| <i>p</i>-Chlorothiophenol <i>See</i> Benzenethiol, <i>p</i> -chloro- | | |
| Chromotropic acid <i>See</i> 2,7-Naphthalenedisulfonic acid, 4,5-dihydroxy- | | |
| Chrysazin  | $C_{14}H_8O_4$ | 63600, 63605, 63610 |
| | Mol. wt. 240 | |
| | m.p. 193° | |

Chrysazin, 4-chloro-5-nitro-

$C_{14}H_6ClN_5$

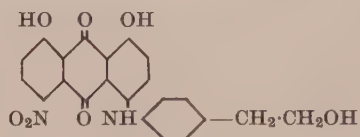
60767



Mol. wt. 319.5

Chrysazin, 4-[*p*-(2-hydroxyethyl)anilino]-5-nitro-

60767



Cinnamic acid

$C_9H_8O_2$

49015

74320



Mol. wt. 148

m.p. 133°

Cinnamoyl chloride

C_9H_7ClO

49015



Mol. wt. 166.5

m.p. 35-36°

b.p. 154°/25 mm.

170-171°/58 mm.

1,6-Cleve's acid

See 2-Naphthalenesulfonic acid, 5-amino-

1,6 (and 1,7)-Cleve's acid

See 2-Naphthalenesulfonic acid, 5(and 8)-amino-

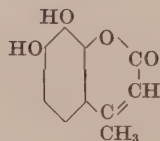
1,7-Cleve's acid

See 2-Naphthalenesulfonic acid, 8-amino-

Coumarin, 7,8-dihydroxy-4-methyl-

$C_{10}H_8O_4$

55015



Mol. wt. 192

m.p. 235°

Cresidine

See *o*-Anisidine, 5-methyl-

Cresol, crude

C_7H_8O

53210, 53211, 53270, 53271

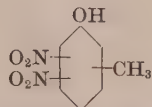


Mol. wt. 108

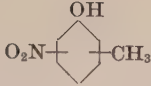

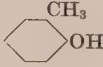
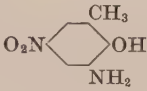

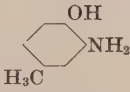
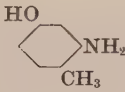
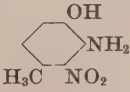
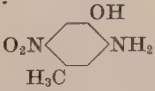
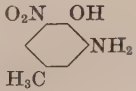
Cresol, dinitro-

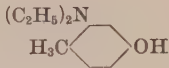
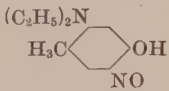
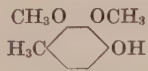
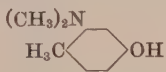
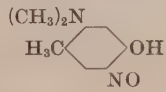
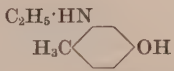
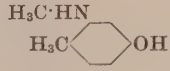
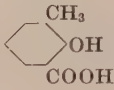
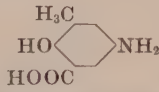
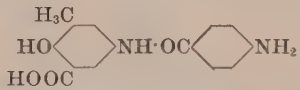
$C_7H_6N_2O_5$

53215



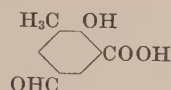
Mol. wt. 198

| | | | |
|-----------------------------------|---|--------------------------|--|
| Cresol, nitro- |  | $C_7H_7NO_3$ | 53215 |
| | | Mol. wt. 153 | |
| m-Cresol |  | C_7H_8O | 53210, 53211 |
| | | Mol. wt. 108 | |
| | | m.p. 11-12° b.p. 202° | |
| o-Cresol |  | C_7H_8O | 10310 11840, 11845, 14170, 14225 20010, 22135, 24900, 26090, 26550 30330 |
| | | Mol. wt. 108 | |
| | | m.p. 31° b.p. 201.8° | |
| o-Cresol, 6-amino-4-nitro- |  | $C_7H_8N_2O_3$ | 18805 |
| | | Mol. wt. 168 | |
| p-Cresol |  | C_7H_8O | 10310 11850, 11855, 11860, 11870, 11875, 14210, 14220, 14225, 14230, 14235, 14240 21240 45550, 45555 |
| | | Mol. wt. 108 | |
| | | m.p. 36° b.p. 201.8° | |
| p-Cresol, 2-amino- |  | C_7H_9NO | 26920, 26925 |
| | | Mol. wt. 123 | |
| p-Cresol, 3-amino- |  | C_7H_9NO | 25080, 25085 45210 |
| | | Mol. wt. 123 | |
| | | m.p. 135° | |
| p-Cresol, 2-amino-3-nitro- |  | $C_7H_8N_2O_3$ | 17130 |
| | | Mol. wt. 168 | |
| p-Cresol, 2-amino-5-nitro- |  | $C_7H_8N_2O_3$ | 16690 |
| | | Mol. wt. 168 | |
| p-Cresol, 2-amino-6-nitro- |  | $C_7H_8N_2O_3$ | 13380, 18841, 14875, 19115 |
| | | Mol. wt. 168 | |

| | | |
|---|-----------------------|---|
| p-Cresol, 3-diethylamino- | $C_{11}H_{17}NO$ | 51015 |
|  | Mol. wt. 179 | |
| | m.p. 49° b.p. 259° | |
| p-Cresol, 5-diethylamino-2-nitroso- | $C_{11}H_{16}N_2O_2$ | 51010 |
|  | Mol. wt. 208 | |
| | m.p. 77° | |
| p-Cresol, 2,3-dimethoxy- | $C_9H_{12}O_3$ | 43875 |
|  | Mol. wt. 168 | |
| p-Cresol, 3-dimethylamino- | $C_9H_{13}NO$ | 51015 |
|  | Mol. wt. 151 | |
| | m.p. 46° | |
| p-Cresol, 5-dimethylamino-2-nitroso- | $C_9H_{12}N_2O_2$ | 51010 |
|  | Mol. wt. 180 | |
| | m.p. 102° | |
| p-Cresol, 3-ethylamino- | $C_9H_{13}NO$ | 11975 45160, 45220 |
|  | Mol. wt. 151 | |
| p-Cresol, 3-methylamino- | $C_8H_{11}NO$ | 45015, 45105 |
|  | Mol. wt. 137 | |
| | m.p. 108° | |
| 2,3-Cresotic acid | $C_8H_8O_3$ | 14180, 14185, 14190, 14195, 14200 22140, 22410, 22415, 22420, 22430, 22885, 23365, 23380, 23660, 23665, 26560, 26565 30070, 30120 43510, 43550, 43555, 43560, 43565, 43570, 43825, 43830, 43835, 43840, 43845, 43850, 43855, 43860, 43865, 44100, 44525 60525 |
|  | Mol. wt. 152 | |
| | m.p. 163–164° | |
| 2,3-Cresotic acid, 5-amino- | $C_8H_9NO_3$ | 18095 |
|  | Mol. wt. 167 | |
| 2,3-Cresotic acid, 5-(p-aminobenzamido)- | $C_{15}H_{14}N_2O_4$ | 17810 26730 |
|  | Mol. wt. 286 | |

2,3-Cresotic acid, 5-formyl- $C_9H_8O_4$

43515, 43865, 43866

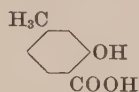


Mol. wt. 180

2,4-Cresotic acid $C_8H_8O_3$

23385

43545

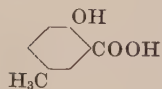


Mol. wt. 152

m.p. 177°

2,5-Cresotic acid $C_8H_8O_3$

43860

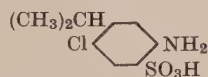


Mol. wt. 152

m.p. 150°

o*-Cresotinic acidSee* 2,3-Cresotic acid***o*-Cresotinic acid, *p*-aldehyde***See* 2,3-Cresotic acid, 5-formyl-**Crocein acid***See* 2-Naphthol-8-sulfonic acid***p*-Cumenesulfonic acid, 2-amino-5-chloro-** $C_9H_{12}ClNO_3S$

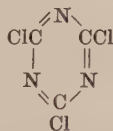
15603



Mol. wt. 249.5

Cyanuric chloride $C_3Cl_3N_3$

13190, 13245, 14155, 17865, 17907, 17908, 17910, 17912, 17916,
17965, 18105, 18156, 18157, 18158, 18159, 18205, 18245,
18971, 18972
26440, 26545, 28500
34040, 34045, 34960
40615, 40618, 40620, 40621, 40622, 40630
61205, 65705



Mol. wt. 184.5

m.p. 154°

2,5-Cyclohexadiene- $\Delta^{1,N}$ -sulfamic acid, 4-phenylimino- $C_{12}H_{10}N_2O_3S$

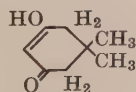
76088



Mol. wt. 262

Cyclohexane, 1,1-bis(*p*-aminophenyl)-*See* Aniline, 4,4'-cyclohexyldenedi-**1,3-Cyclohexanedione, 5,5-dimethyl-** $C_8H_{12}O_2$

11945

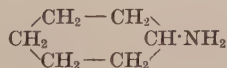


Mol. wt. 140

Cyclohexylamine $C_6H_{13}N$

10365

60720, 61107, 61715, 62045, 62050, 62515, 62565, 64005



Mol. wt. 99

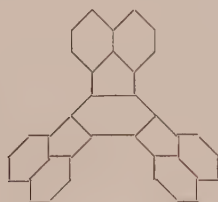
b.p. 134°

D

Decacyclene

$C_{36}H_{18}$

53320, 53321



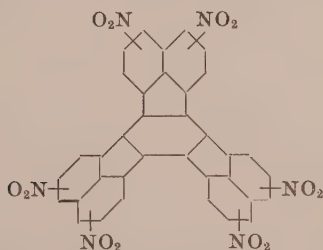
Mol. wt. 450

m.p. 387°

Decacyclene, hexanitro-

$C_{36}H_{12}N_6O_{12}$

53327, 53328

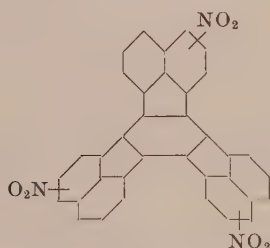


Mol. wt. 720

Decacyclene, trinitro-

$C_{36}H_{15}N_3O_6$

53325, 53326



Mol. wt. 585

Dehydrothio-*p*-toluidine

See Benzothiazole, 2-(*p*-aminophenyl)-6-methyl-

Dehydrothio-*p*-toluidinesulfonic acid

See 7-Benzothiazolesulfonic acid, (2-*p*-aminophenyl)-6-methyl-

o-Dianisidine

See Benzidine, 3,3'-dimethoxy-

1,1'-Dianthraquinonyl, 2,2'-dimethyl-

See 1,1'-Bianthraquinone, 2,2'-dimethyl-

2,2'-Dianthraquinonyl, 1,1'-diamino-

See 2,2'-Bianthraquinone, 1,1'-diamino-

1,1'-Dianthraquinonylamine

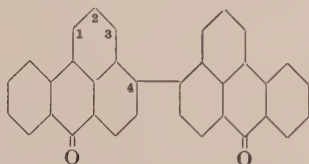
See Anthraquinone, 1,1'-iminodi-

1,1'-Dianthrimide

See Anthraquinone, 1,1'-iminodi-

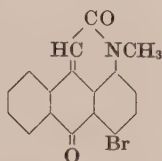
1,1'-Dianthrimide, 2-bromo-

See Anthraquinone, 2-bromo-1,1'-iminodi-

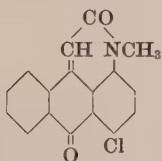
1,1'-Dianthrime, 4,4'-diamino-*See Anthraquinone, 1,1'-iminobis[4-amino-***1,1'-Dianthrime, 4,4'-dibenzamido-***See Anthraquinone, 1,1'-iminobis[4-benzamido-***Dibenzanthrone***See Violanthrone***4,4'-Dibenzanthronyl** $C_{34}H_{18}O_2$ 59860

Mol. wt. 458

m.p. 320–321°

7H-Dibenz[*f,j*]isoquinoline-2,7(3H)-dione, 6-bromo-3-methyl- $C_{17}H_{10}BrNO_2$ 68200, 68205, 68210, 68215, 68220, 68225, 68230

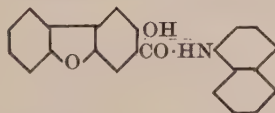
Mol. wt. 340

7H-Dibenz[*f,j*]isoquinoline-2,7(3H)-dione, 6-chloro-3-methyl- $C_{17}H_{10}ClNO_2$ 68210, 68215

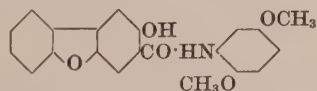
Mol. wt. 295.5

Dibenzofuran, 3-amino-2-methoxy- $C_{13}H_{11}NO_2$ 37580

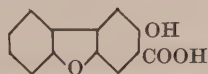
Mol. wt. 202

3-Dibenzofurancarboxamide, 2-hydroxy-N-1-naphthyl- $C_{23}H_{15}NO_3$ 37608

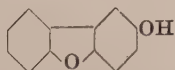
Mol. wt. 353

3-Dibenzofurancarboxanilide, 2-hydroxy-2',5'-dimethoxy- $C_{21}H_{17}NO_5$ 12800
37605

Mol. wt. 349

3-Dibenzofurancarboxylic acid, 2-hydroxy- $C_{13}H_8O_4$ 37608

Mol. wt. 228

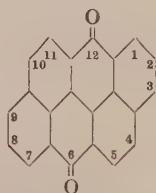
2-Dibenzofuranol $C_{12}H_8O_2$ 19600

Mol. wt. 184

Dibenzo[*a,i*]pyrene-5,8-dione $C_{24}H_{12}O_2$ 59115, 59120

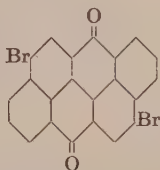
Mol. wt. 332

m.p. 365°

Dibenzo[*cd,jk*]pyrene-6,12-dione $C_{22}H_{10}O_2$ 59300, 59305

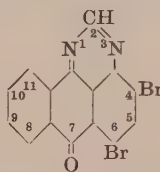
Mol. wt. 306

m.p. 300°

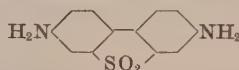
**Dibenzo[*cd,jk*]pyrene-6,12-dione,
4,10-dibromo-** $C_{22}H_8Br_2O_2$ 59310, 59311
65225

Mol. wt. 464

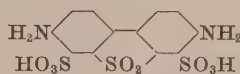
m.p. > 360°

7*H*-Dibenzo[*de,h*]quinazolin-7-one, 4,6-dibromo- $C_{16}H_6Br_2N_2O$ 68415

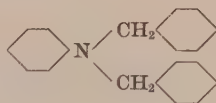
Mol. wt. 390

3,7-Dibenzothiophenediamine, 5,5-dioxide $C_{12}H_{10}N_2O_2S$ 25720

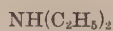
Mol. wt. 246

**4,6-Dibenzothiophenedisulfonic acid,
3,7-diamino-, 5,5-dioxide** $C_{12}H_{10}N_2O_8S_3$ 25730, 25735

Mol. wt. 406

Dibenzylamine, *N*-phenyl- $C_{20}H_{19}N$ 42065, 42120

Mol. wt. 273

m.p. 71-72°
b.p. > 300°
(decomp.)**Dicyandiamide***See* Guanidine, cyano-**Diethanolamine***See* Ethanol, 2,2'-iminodi-**Diethylamine** $C_4H_{11}N$ 45170

Mol. wt. 63

m.p. -40°
b.p. 55.5°/759 mm.

Diglycolamine

See Ethanol, 2-(2-aminoethoxy)-

Dihydroindole, 2-methyl-

See Indoline, 2-methyl-

Di-J acid

See 1-Naphthol-3-sulfonic acid, 6,6'-iminobis-

Dimethylamine

$\text{C}_2\text{H}_7\text{N}$

45050

51195

Mol. wt. 45

74380

b.p. 8°

1,1'-Dinaphthyl, 4,4'-dibenzoyl-

See 1,1'-Binaphthyl, 4,4'-dibenzoyl-

1,1'-Dinaphthyl-8,8'-dicarboxylic acid

See [1,1'-Binaphthalene]-8,8'-dicarboxylic acid

1,1'-Dinaphthyl-8,8'-dicarboxylic acid, 5,5'-dimethoxy-

See [1,1'-Binaphthalene]-8,8'-dicarboxylic acid, 5,5'-dimethoxy-

Diphenylamine

$\text{C}_{12}\text{H}_{11}\text{N}$

10355, 10360

11080, 13060, 13065, 13070, 13075, 13080, 13085, 13090, 13091, 13095, 13096, 13105, 13110, 13115

Mol. wt. 169

42125, 42780

m.p. 54°

b.p. 310°

Diphenylamine, 4,4'-bis(dimethylamino)-

$\text{C}_{16}\text{H}_{21}\text{N}_3$

76125



Mol. wt. 255

m.p. 119°

Diphenylamine, 4,4'-diamino-

$\text{C}_{12}\text{H}_{13}\text{N}_3$

21270, 25050, 25055, 25060

31995, 32000, 32005

37245, 37260

49400, 50200

76120



Mol. wt. 199

m.p. 158°

Diphenylamine, N-ethyl-

$\text{C}_{14}\text{H}_{15}\text{N}$

42745



Mol. wt. 197

Diphenylamine, N-methyl-

$\text{C}_{13}\text{H}_{13}\text{N}$

42630, 42790, 43530



Mol. wt. 183

b.p. 296°

Diphenylamine-2-sulfonic acid, 4,4'-diamino-

See Benzenesulfonic acid, 2-amino-5-(*p*-aminoanilino)-

Diphenyl-4-carboxylic acid

See 4-Biphenylcarboxylic acid

2,2'-Diphenyl ether disulfonic acid, *p,p'*-diamino-

See Metanilic acid, 6,6'-oxydi-

Diphenylmethane, tetramethyldiamino-

See Aniline, 4,4'-methylenebis[*N,N*-dimethyl-

**2-Diphenylmethanecarboxylic acid,
4'-amino-3'-methyl-, ethyl ester**

See *o*-Toluic acid, α -(4-amino-*m*-tolyl)-, ethyl ester

Diphenylsulfone, 4,4'-dichloro-3,3'-dinitro-

See Sulfone, bis(4-chloro-3-nitrophenyl)

4,7-Dithiaisoindoline, 1,3-diimino-5,6-dimethyl-

See Pyrrolo[3,4-*b*]-*p*-dithiin, 5,7-dihydro-
5,7-diimino-2,3-dimethyl-

Di-*m*-tolylamine, 4,4'-diamino-

$C_{14}H_{17}N_3$

25070

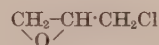


E

Epichlorohydrin

C_3H_5ClO

61550, 62505, 62510



Mol. wt. 92.5

b.p. 115-117°

Epsilon acid (ϵ -acid)

See 1-Naphthol-3,8-disulfonic acid

Epsilon acid, diphenyl-

See 1-Naphthalenesulfonic acid, 6,8-dianilino-

Ethane, bromo-

C_2H_5Br

C_2H_5Br

42590

Mol. wt. 109

m.p. -116°
b.p. 38.4°

Ethane, chloro-

C_2H_5Cl

C_2H_5Cl

24895

45175

63295

Mol. wt. 64.5

m.p. -141.6°
b.p. 12.5°

Ethane, 1,2-dibromo-

$CH_2Br \cdot CH_2Br$

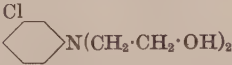
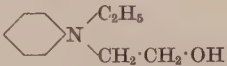
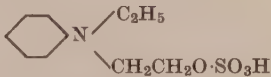
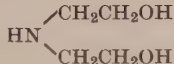
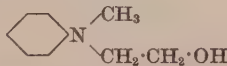
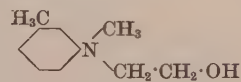
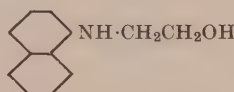
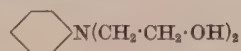
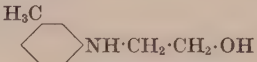
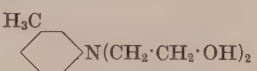
$C_2H_4Br_2$

71200, 71205

Mol. wt. 188

m.p. 10°
b.p. 131.7°

| | | | |
|---|---|--|-----------------------------------|
| Ethane, iodo- | C_2H_5I | C_2H_5I | 42530 |
| | | Mol. wt. 156 | |
| | | m.p. -108.5° b.p. 72.3° | |
| Ethanesulfonic acid, 2-amino- <i>See</i> Taurine | | | |
| Ethanol, 2-amino- | $HO \cdot CH_2 \cdot CH_2 \cdot NH_2$ | C_2H_7NO | 60507, 61505, 61545, 62065, 62500 |
| | | Mol. wt. 61 | |
| | | b.p. 171° | |
| Ethanol, 2-(<i>m</i> -aminoanilino)- | | $C_8H_{12}N_2O$ | 31575, 35440 |
| | | Mol. wt. 152 | |
| Ethanol, 2-(<i>p</i> -aminoanilino)- | | $C_8H_{12}N_2O$ | 60767 |
| | | Mol. wt. 152 | |
| Ethanol, sulfate ester 2-(4-amino-2,5-dimethoxyphenylsulfonyl)-, | | $C_{10}H_{15}NO_8S_2$ | 18852 |
| | | Mol. wt. 341 | |
| Ethanol, 2-(2-aminoethoxy)- | $HO \cdot CH_2 \cdot CH_2 \cdot O \cdot CH_2 \cdot CH_2 \cdot NH_2$ | $C_4H_{11}NO_2$ | 61510 |
| | | Mol. wt. 105 | |
| Ethanol, 2-(<i>p</i> -aminophenoxy)- | | $C_8H_{11}NO_2$ | 14240 |
| | | Mol. wt. 137 | |
| Ethanol, sulfate ester 2-(<i>m</i> -aminophenylsulfonyl)-, | | $C_8H_{11}NO_6$ | 61200 |
| | | Mol. wt. 217 | |
| Ethanol, 2-(<i>N</i> -butylanilino)- | | $C_{12}H_{19}NO$ | 11120, 11125 |
| | | Mol. wt. 193 | |
| Ethanol, 2-(<i>N</i> -butyl-6-methoxy- <i>m</i> -toluidino)- | | $C_{14}H_{23}NO_2$ | 11205 |
| | | Mol. wt. 237 | |
| Ethanol, 2-(<i>N</i> -butyl- <i>m</i> -toluidino)- | | $C_{13}H_{21}NO$ | 11195, 11200 |
| | | Mol. wt. 207 | |

| | | |
|---|----------------------|-------------------------------------|
| Ethanol, 2-chloro- | C_2H_5ClO | 61540 |
| $ClCH_2 \cdot CH_2 \cdot OH$ | Mol. wt. 80.5 | |
| | b.p. 129.5° | |
| Ethanol, 2,2'-(<i>m</i>-chlorophenylimino)di- | $C_{10}H_{14}ClNO_2$ | 11150, 11152 |
|  | Mol. wt. 215.5 | |
| Ethanol, 2-(<i>N</i>-ethylanilino)- | $C_{10}H_{15}NO$ | 11110, 11115, 13056 |
|  | Mol. wt. 168 | |
| Ethanol, sulfate ester 2-(<i>N</i>-ethylanilino)- | $C_{10}H_{15}NO_4S$ | 13055 |
|  | Mol. wt. 245 | |
| Ethanol, 2,2'-iminodi- | $C_4H_{11}NO_2$ | 40622 |
|  | Mol. wt. 105 | |
| Ethanol, 2-(<i>N</i>-methylanilino)- | $C_9H_{13}NO$ | 11100 |
|  | Mol. wt. 151 | |
| Ethanol, 2-(<i>N</i>-methyl-<i>m</i>-toluidino)- | $C_{10}H_{15}NO$ | 11190 |
|  | Mol. wt. 165 | |
| Ethanol, 2-(1-naphthylamino)- | $C_{12}H_{13}NO$ | 13379 |
|  | Mol. wt. 187 | |
| Ethanol, 2,2'-(phenylimino)di- | $C_{10}H_{15}NO_2$ | 11129, 11130, 11135, 11136, 13058 |
|  | Mol. wt. 181 | |
| Ethanol, 2-<i>m</i>-toluidino- | $C_9H_{13}NO$ | 11180 |
|  | Mol. wt. 151 | |
| Ethanol, 2,2'-(<i>m</i>-tolylimino)di- | $C_{11}H_{17}NO_2$ | 11210, 11215, 11220, 11225 42705 |
|  | Mol. wt. 195 | |

Ethanolamine

See Ethanol, 2-amino-

| | | |
|------------------------------|-------------------|-------|
| Ethylamine | C_2H_7N | 63330 |
| $CH_3 \cdot CH_2 \cdot NH_2$ | Mol. wt. 45 | |
| | b.p. 16.6° | |

| | | |
|---------------------------|--|--|
| Ethyl bromide | | |
| <i>See</i> Ethane, bromo- | | |

| | | |
|----------------------------|--|--|
| Ethyl chloride | | |
| <i>See</i> Ethane, chloro- | | |

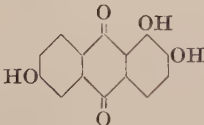
| | | |
|--------------------------|--|--|
| Ethyl iodide | | |
| <i>See</i> Ethane, iodo- | | |

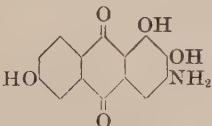
| | | |
|-------------------------------|--|--|
| Ethylene chlorohydrin | | |
| <i>See</i> Ethanol, 2-chloro- | | |

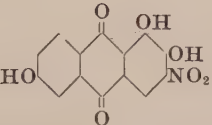
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| Ethylene dibromide | | |
| <i>See</i> Ethane, 1,2-dibromo- | | |

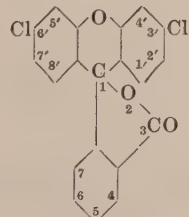
F

| | | |
|---------------------------------------|--|--|
| F acid | | |
| <i>See</i> 2-Naphthol-7-sulfonic acid | | |

| | | |
|--|-------------------|---------------------|
| Flavopurpurin | $C_{14}H_8O_5$ | 58245, 58250, 58605 |
|  | Mol. wt. 256 | |
| | m.p. $>330^\circ$ | |

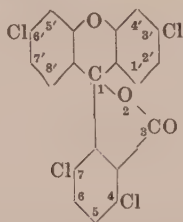
| | | |
|---|-----------------|--------------|
| Flavopurpurin, 3-amino- | $C_{14}H_9NO_5$ | 67425, 67430 |
|  | Mol. wt. 271 | |

| | | |
|---|-----------------|--------------|
| Flavopurpurin, 3-nitro- | $C_{14}H_7NO_7$ | 67425, 67430 |
|  | Mol. wt. 301 | |

| | | |
|---|-----------------------|--|
| Fluoran, 3',6'-dichloro- | $C_{20}H_{10}Cl_2O_3$ | 45170, 45185, 45186, 45190, 45195, 45200 |
|  | Mol. wt. 369 | |
| | m.p. $250-253^\circ$ | |

| | | |
|---|--|--|
| Fluoran, 4,7-dichloro-3',6'-dihydroxy- | | |
| <i>See</i> Fluorescein, 4,7-dichloro- | | |

| | | |
|--|--|--|
| Fluoran, 4,5,6,7-tetrachloro-3',6'-dihydroxy- | | |
| <i>See</i> Fluorescein, 4,5,6,7-tetrachloro- | | |

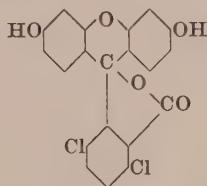
Fluoran, 3',4,6',7-tetrachloro- $C_{20}H_8Cl_4O_3$ 45205

Mol. wt. 438

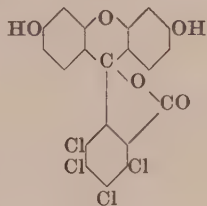
2-Fluorenamine $C_{13}H_{11}N$ 51325

Mol. wt. 181

m.p. 129°

Fluorene, 2-amino-*See* 2-Fluorenamine**Fluorescein dichloride***See* Fluoran, 3',6'-dichloro-**Fluorescein, 4,7-dichloro-** $C_{20}H_{10}Cl_2O_5$ 45375, 45376, 45435

Mol. wt. 401

Fluorescein, 4,5,6,7-tetrachloro- $C_{20}H_8Cl_4O_5$ 45420, 45440

Mol. wt. 470

Formaldehyde CH_2O $H \cdot CHO$

Mol. wt. 30

Gas, b.p. -21°
usually a 40%
aqueous solution41005, 42615, 42620, 42645, 42650, 42665, 42666, 42680, 42720,
42725, 42780, 43510, 43810, 43815, 43860, 43865, 43866,
43870, 44100, 44525, 45005, 45010, 45015, 45225, 45315,
46020, 51085
63315, 63320, 63325, 63605, 65265, 67420, 70005, 70010**Formamide, *N,N'*-*p*-phenylenebis-** $C_8H_8N_2O_2$

53090, 53091

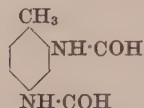


Mol. wt. 164

m.p. 205-207°



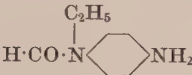
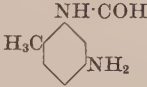
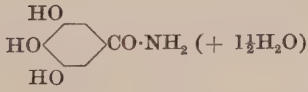
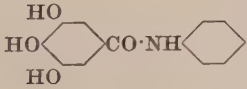
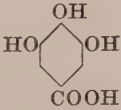
Formamide, *N,N'*-2,4-tolylenebis- $C_9H_{10}N_2O_2$

53120, 53121



Mol. wt. 178

m.p. 176-177°

| | | |
|---|---|--|
| Formanilide, <i>m</i>-amino- | $C_7H_8N_2O$ | 11015 29110, 29210 31500, 31505, 31510, 31515, 31520, 31530 35310 |
|  | Mol. wt. 136 | |
| Formanilide, <i>p</i>-amino- | $C_7H_8N_2O$ | 30020, 35290 |
|  | | |
| Formanilide, <i>p</i>-amino-<i>N</i>-ethyl- | $C_9H_{12}N_2O$ | 16590 |
|  | | |
| Formic acid | CH_2O_2 | 46030 48070, 48075, 48080 |
| $H\cdot COOH$ | Mol. wt. 46 m.p. 8.5° b.p. 100.6° | |
| o-Formotoluidide, 5'-amino- | $C_8H_{10}N_2O$ | 53040 |
|  | Mol. wt. 150 | |
| Fustic extract | | |
| <i>See</i> Benzophenone, 2,3',4,4',6-pentahydroxy- | | |
| G | | |
| G acid | | |
| <i>See</i> 2-Naphthol-6,8-disulfonic acid | | |
| Gallamide | $C_7H_7NO_4$ | 51045, 51050, 51090, 51165, 51170, 52045 |
|  | Mol. wt. 169 (+1½H₂O) | |
| | m.p. 243° (anhydrous) | |
| Gallanilide | $C_{13}H_{11}NO_4$ | 51065, 51090, 52045 |
|  | Mol. wt. 245 (+2H₂O) | |
| | m.p. 207° | |
| Gallic acid | $C_7H_6O_5$ | 45445, 51025, 51030, 51090, 52045, 55005, 55010 58200, 58600, 66900 75220, 75230 |
|  | Mol. wt. 170 <i>Monohydrate</i> (+ 18) | |
| | m.p. 220-240° | |

Gallic acid, methyl ester $C_8H_8O_5$

51040, 52045

Mol. wt. 184
(+3H₂O)m.p. 202°
loses water of
crystallisation at
100–110°**Gamma acid (γ-acid)***See* 1-Naphthol-3-sulfonic acid, 7-amino-**Gamma acid, N-p-anisyl-***See* 1-Naphthol-3-sulfonic acid, 7-*p*-anisidino-**Gamma acid, N-p-carboxyphenyl-***See* Benzoic acid, *p*-(8-hydroxy-6-sulfo-2-naphthylamino)-**Gamma acid, N-phenyl-***See* 1-Naphthol-3-sulfonic acid, 7-anilino-**Gamma acid, N-(3-carboxy-4-hydroxyphenylsulfonyl)-
N-methyl-***See* Salicylic acid, 5-[N-(8-hydroxy-6-sulfo-2-naphthyl)-
N-methylsulfamoyl]-**Gamma acid, N-2-sulfoethyl-***See* 1-Naphthol-3-sulfonic acid, 7-(2-sulfoethylamino)-**Gamma acid, N-sulfomethyl-***See* 1-Naphthol-3-sulfonic acid, 7-(sulfomethylamino)-**Glycerol** $C_3H_8O_3$

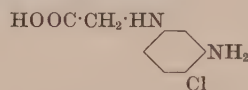
46000



Mol. wt. 92

m.p. 20°
b.p. 290°59800, 67405, 67410, 67415, 67420, 67425, 67430, 67435, 67440,
67445, 67450, 68705**Glycine, N-(3-amino-4-chlorophenyl)-** $C_8H_9ClN_2O_2$

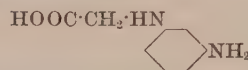
13295



Mol. wt. 200.5

Glycine, N-(*m*-aminophenyl)- $C_8H_9N_2O_2$

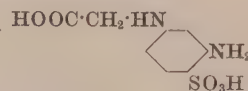
31515, 31610, 31690, 32005



Mol. wt. 166

Glycine, N-(3-amino-4-sulfophenyl)- $C_8H_9N_2O_5S$

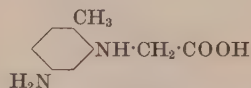
13265



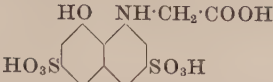
Mol. wt. 246

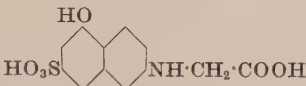
Glycine, N-(5-amino-*o*-tolyl)- $C_9H_{11}N_2O_2$

30255, 31545, 31550, 31580




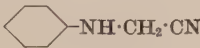
Mol. wt. 180

| | | |
|---|-----------------------|--------------|
| Glycine, N-(8-hydroxy-3,6-disulfo-1-naphthyl)- | $C_{12}H_{11}NO_9S_2$ | 17236, 17660 |
|  | Mol. wt. 377 | |


| | | |
|---|---------------------|----------------------------|
| Glycine, N-(5-hydroxy-7-sulfo-2-naphthyl)- | $C_{12}H_{11}NO_6S$ | 22330, 22630, 23645, 24300 |
|  | Mol. wt. 297 | |

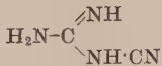
| | | |
|---|--------------------|---------------------|
| Glycine, N-1-naphthyl- | $C_{12}H_{11}NO_2$ | 22125, 22220, 25720 |
|  | Mol. wt. 177 | |

| | | |
|---|---------------|-------|
| Glycine, N-phenyl- | $C_8H_9NO_2$ | 73000 |
|  | Mol. wt. 151 | |
| | m.p. 126–127° | |

| | | |
|---|--------------|-------|
| Glycinonitrile, N-phenyl- | $C_8H_8N_2$ | 73000 |
|  | Mol. wt. 132 | |
| | m.p. 48° | |

| | | |
|---|--|--|
| Glycolic acid, 4,4'-diamino-3,3'-biphenyldi- | | |
| <i>See Acetic acid, (4,4'-diamino-3,3'-biphenylenedioxy)di-</i> | | |

| | | |
|---|---|---------------------|
| Glyoxal | $C_2H_2O_2$ | 59500, 70400, 71025 |
|  | Mol. wt. 58 | |
| | m.p. 15° b.p. 51° Glyoxal sulfate, m.p. 176–177° | |

| | | |
|---|---------------|-------|
| Guanidine, cyano- | $C_2H_4N_4$ | 74160 |
|  | Mol. wt. 84 | |
| | m.p. 207–209° | |

H

H acid

See 1-Naphthol-3,6-disulfonic acid, 8-amino-

H acid, N-acetyl-

See 1-Naphthol-3,6-disulfonic acid, 8-acetamido-

H acid, N-(p-aminobenzoyl)-

See 1-Naphthol-3,6-disulfonic acid,
8-(p-aminobenzamido)-

H acid, *N*-benzenesulfonyl-

See 1-Naphthol-3,6-disulfonic acid, 8-phenylsulfonamido-

H acid, *N*-benzoyl-

See 1-Naphthol-3,6-disulfonic acid, 8-benzamido-

H acid, *N*-benzyl-

See 1-Naphthol-3,6-disulfonic acid, 8-benzylamino-

H acid, *N*-carboxymethyl-

See Glycine, *N*-(8-hydroxy-3,6-disulfo-1-naphthyl)-

H acid, *N-p*-tosyl-

See 1-Naphthol-3,6-disulfonic acid, 8-*p*-tolylsulfonamido-

H acid, *O-p*-tosyl-

See 1-Naphthol-3,6-disulfonic acid,
8-amino-, *p*-toluenesulfonate

Hydrazine

H₄N₂ 48052

60705

"Hydrazine hydrate" is an aqueous solution of hydrazine of constant b.p. (113.5°)

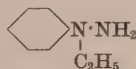
Mol. wt. 32



m.p. 1.4°
b.p. 113.5°

Hydrazine, 1-ethyl-1-phenyl-

C₈H₁₂N₂ 16610



Mol. wt. 136

Hydroxyhydroquinone

See 1,2,4-Benzenetriol

I

Imino-1,1'-bianthraquinone

See Anthraquinone, 1,1'-iminodi-

Imino-1,1'-bianthraquinone, 2-bromo-

See Anthraquinone, 2-bromo-1,1'-iminodi-

Imino-1,1'-bianthraquinone, 4,4'-diamino-

See Anthraquinone, 1,1'-iminobis[4-amino-

**Imino-1,1'-bianthraquinone,
4,4'-dibenzamido-**

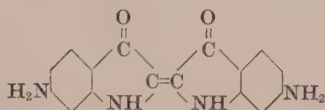
See Anthraquinone, 1,1'-iminobis[4-benzamido-

4,4'-Iminodiphenol

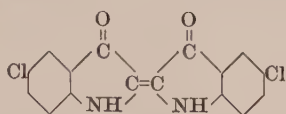
See Phenol, 4,4'-iminodi-

Indigotin, 6,6'-diamino-

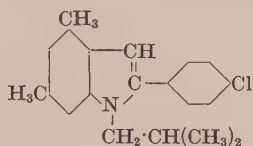
C₁₆H₁₂N₄O₂ 73080



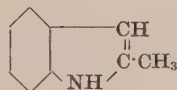
Mol. wt. 292

Indigotin, 4,5:4'5'-dibenzo-*See* β -Naphthindigo**Indigotin, 5,5'-dichloro-** $C_{16}H_8Cl_2N_2O_2$ 73050

Mol. wt. 331

Indole, 2-(p-chlorophenyl)-1-isobutyl-4,6-dimethyl- $C_{20}H_{22}ClN$ 44505, 44515

Mol. wt. 311.5

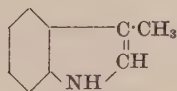
Indole, 3-formyl-1-methyl-2-phenyl-*See* 3-Indolecarboxaldehyde, 1-methyl-2-phenyl-**Indole, 2-methyl-** C_9H_9N 19300

Mol. wt. 131

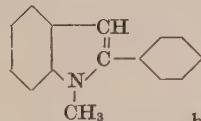
22905

34280

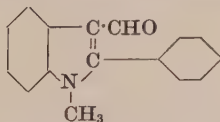
44520, 48035, 48060

m.p. 61°
b.p. 272°/750 mm.**Indole, 3-methyl-** C_9H_9N 48070

Mol. wt. 131

m.p. 95°
b.p. 265–266°/755 mm.**Indole, 1-methyl-2-phenyl-** $C_{15}H_{13}N$ 44500, 44510

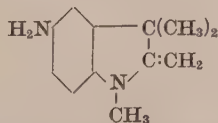
Mol. wt. 207

m.p. 97–99°
b.p. 190–200°/10–12 mm.**3-Indolecarboxaldehyde, 1-methyl-2-phenyl-** $C_{16}H_{13}NO$ 48040

Mol. wt. 235

Indolesulfonic acid, 2-methyl- $C_9H_9NO_3S$ 25325

Mol. wt. 211

Indoline, 5-amino-1,3,3-trimethyl-2-methylene- $C_{12}H_{16}N_2$ 48080

Mol. wt. 188

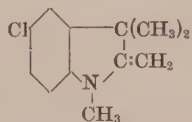
**Indoline,
5-carbomethoxy-1,3,3-trimethyl-2-methylene-**

See 5-Indolinecarboxylic acid, 1,3,3-trimethyl-2-methylene-, methyl ester

**Indoline,
5-chloro-1,3,3-trimethyl-2-methylene-**

$C_{12}H_{14}ClN$ 48025

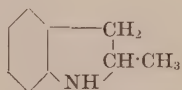
Mol. wt. 207.5



Indoline, 2-methyl-

$C_9H_{11}N$ 48060

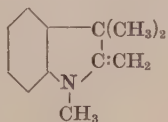
Mol. wt. 133



Indoline, 1,3,3-trimethyl-2-methylene-

$C_{12}H_{15}N$ 48010, 48013, 48015, 48020, 48040

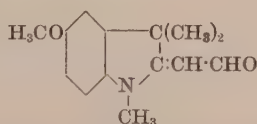
Mol. wt. 173



$\Delta^{2,\alpha}$ -Indolineacetaldehyde, 5-methoxy-1,3,3-trimethyl-

$C_{14}H_{17}NO_2$ 48075

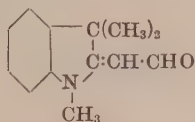
Mol. wt. 231



$\Delta^{2,\alpha}$ -Indolineacetaldehyde, 1,3,3-trimethyl-

$C_{13}H_{15}NO$ 48035, 48055, 48060, 48065, 48070

Mol. wt. 201

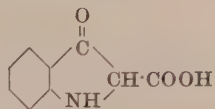


2-Indolinecarboxylic acid, 3-oxo-

$C_9H_7NO_3$ 73820

Mol. wt. 177

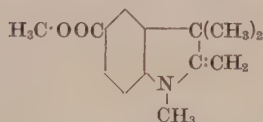
m.p. 122-123°



**5-Indolinecarboxylic acid,
1,3,3-trimethyl-2-methylene-, methyl ester**

$C_{14}H_{17}NO_2$ 48030

Mol. wt. 199

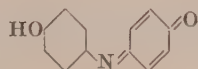


Indophenol

$C_{12}H_9NO_2$ 53400

Mol. wt. 199

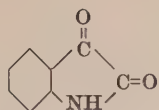
m.p. 160°



Indoxylic acid

See 2-Indolinecarboxylic acid, 3-oxo-

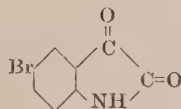
Isatin $\text{C}_8\text{H}_5\text{NO}_2$ 73000, 73200, 73215, 73635, 73655



Mol. wt. 147

m.p. 200–201°

Isatin, 5-bromo- $\text{C}_8\text{H}_4\text{BrNO}_2$ 73645

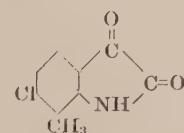


Mol. wt. 226

m.p. 255°

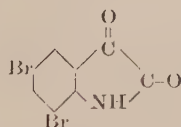
Isatin, α -chloride, 5,6-benzo-7-chloro-
See 3H-Benz[f]indol-3-one, 2,9-dichloro-

Isatin, 6-chloro-7-methyl- $\text{C}_9\text{H}_6\text{ClNO}_2$ 73680



Mol. wt. 195.5

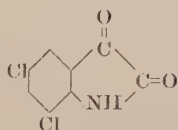
Isatin, 5,7-dibromo- $\text{C}_8\text{H}_3\text{Br}_2\text{NO}_2$ 73210, 73650, 73655



Mol. wt. 305

m.p. 248–250°

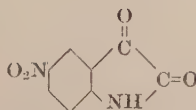
Isatin, 5,7-dichloro- $\text{C}_8\text{H}_3\text{Cl}_2\text{NO}_2$ 73205, 73640



Mol. wt. 216

m.p. yellow form, 223°
red form, 313°

Isatin, 5-nitro- $\text{C}_8\text{H}_4\text{N}_2\text{O}_4$ 73625



Mol. wt. 192

m.p. 248–250°
or 253–255°

Isatin- α -anilide
See Pseudoindoxyl, 2-phenylimino-

Isohendecylamine $\text{C}_{11}\text{H}_{25}\text{N}$ 74400

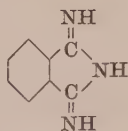


Mol. wt. 171

Isoindoline, 1,3-diimino-

$C_8H_7N_3$

74160

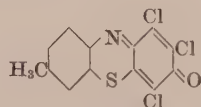


Mol. wt. 145

**3H-Isophenothiazin-3-one,
1,2,4-trichloro-7-methyl-**

$C_{13}H_6Cl_3NOS_2$

53830

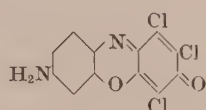


Mol. wt. 330.5

**3H-Isophenoxazin-3-one,
7-amino-1,2,4-trichloro-**

$C_{12}H_5Cl_3N_2O_2$

53800

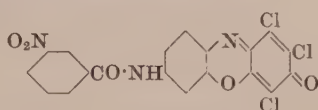


Mol. wt. 315.5

**3H-Isophenoxazin-3-one,
1,2,4-trichloro-7-(*m*-nitrobenzamido)-**

$C_{19}H_8Cl_3N_3O_5$

53810

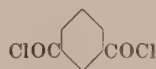


Mol. wt. 464.5

Isophthaloyl chloride

$C_8H_4Cl_2O_2$

65410, 65415, 65420



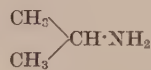
Mol. wt. 203

m.p. 43-44°

Isopropylamine

C_3H_9N

61551, 62040



Mol. wt. 59

b.p. 32°

4,4'-Isopropylidenedianiline

See Aniline, 4,4'-isopropylidenedi-

Isoquinoline

C_9H_7N

47040



Mol. wt. 129

m.p. 28°
b.p. 243-25°

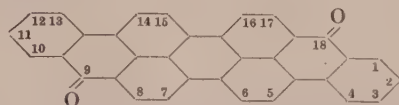
Isoundecylamine

See Isohendecylamine

Isoviolanthrone

$C_{34}H_{16}O_2$

60005, 60006, 60010, 60011, 60015



Mol. wt. 456

J

J acid

See 1-Naphthol-3-sulfonic acid, 6-amino-

J-acid, *N*-(4-amino-*m*-toluoyl)-

See 1-Naphthol-3-sulfonic acid, 6-(4-amino-3-methylbenzamido)-

J acid, *N*-benzoyl-

See 1-Naphthol-3-sulfonic acid, 6-benzamido-

J acid, *N*-(3-carboxy-4-hydroxyphenyl)-

See Salicylic acid, 5-(5-hydroxy-7-sulfo-2-naphthylamino)-

J acid, *N*-(3-carboxy-4-hydroxyphenylsulfonyl)-*N*-methyl-

See Salicylic acid,
5-[*N*-(5-hydroxy-7-sulfo-2-naphthyl)-*N*-methylsulfamoyl]-

J acid, *N*-carboxymethyl-

See Glycine, *N*-(5-hydroxy-7-sulfo-2-naphthyl)-

J acid, *N*-*m*-carboxyphenyl-

See Benzoic acid, *m*-(5-hydroxy-7-sulfo-2-naphthylamino)-

J acid urea

See 1-Naphthol-3-sulfonic acid, 6,6'-ureylenebis-

K

K acid

See 1-Naphthol-3,5-disulfonic acid, 8-amino-

K acid, *N*-benzoyl-

See 1-Naphthol-3,5-disulfonic acid, 8-benzamido-

L

Laurent's acid

See 1-Naphthalenesulfonic acid, 5-amino-

M

M acid

See 1-Naphthol-3-sulfonic acid, 5-amino-

Maclurin

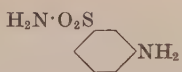
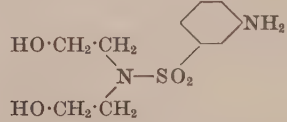
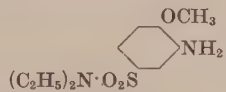
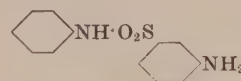
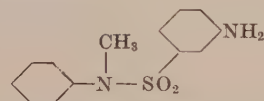
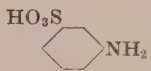
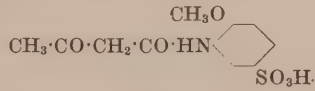
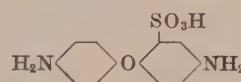
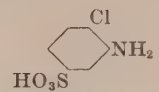
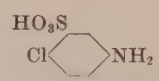
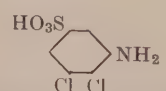
See Benzophenone, 2,3',4,4',6-pentahydroxy-

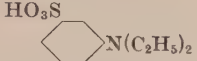

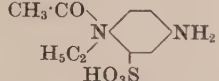
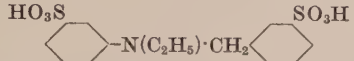
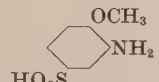
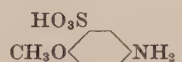
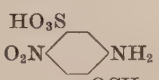
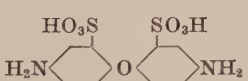
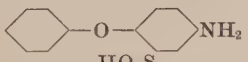
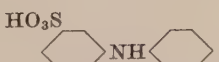
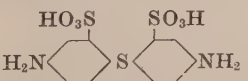
o-Mercaptoaniline

See Benzenethiol, *o*-amino-

Mesidine

See Aniline, 2,4,6-trimethyl-

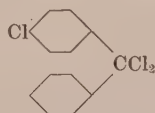
| | | |
|---|-----------------------|---|
| Metanilamide | $C_6H_8N_2O_2S$ | 19065 |
|  | Mol. wt. 172 | |
| Metanilamide, <i>N</i>¹,<i>N</i>¹-bis(2-hydroxyethyl)- | $C_{10}H_{16}N_2SO_4$ | 62150 |
|  | Mol. wt. 260 | |
| Metanilamide, <i>N</i>¹,<i>N</i>¹-diethyl-4-methoxy- | $C_{11}H_{13}N_2O_3S$ | 12490, 12783, 16265 |
|  | Mol. wt. 258 | |
| Metanilanilide | $C_{12}H_{12}N_2O_2S$ | 18900, 18969 |
|  | Mol. wt. 248 | |
| Metanilanilide, <i>N</i>¹-methyl- | $C_{13}H_{14}N_2O_2S$ | 62160 |
|  | Mol. wt. 262 | |
| Metanilic acid | $C_6H_7NO_3S$ | 13065, 13070, 13075, 13445, 14005, 14006, 14345, 15980, 19320, 20080, 20130, 22000, 26305, 26320, 26360, 26400, 27880, 28250, 29000 |
|  | Mol. wt. 173 | 30000, 30135, 34125, 34138, 34139, 34146, 34220, 34260, 35020, 35025, 40210, 40225, 40245, 40260, 42551, 61205:1, 61211, 62530 |
| Metanilic acid, <i>N</i>-acetoacetyl-4-methoxy- | $C_{11}H_{13}NO_6S$ | 25340 |
|  | Mol. wt. 287 | |
| Metanilic acid, 6-(<i>p</i>-aminophenoxy)- | $C_{12}H_{12}N_2O_4S$ | 25080, 25085 |
|  | Mol. wt. 280 | |
| Metanilic acid, 4-chloro- | $C_6H_6ClNO_3S$ | 14185, 20255 |
|  | Mol. wt. 207.5 | |
| Metanilic acid, 6-chloro- | $C_6H_6ClNO_3S$ | 13105, 14007, 15825, 26361, 26925, 29010, 30385 |
|  | Mol. wt. 207.5 | |
| Metanilic acid, 4,5-dichloro- | $C_6H_5Cl_2NO_3S$ | 15826 |
|  | Mol. wt. 242 | |

| | | |
|---|---|------------------------------|
| Metanilic acid, <i>N,N</i> -diethyl- | $C_{10}H_{15}NO_3S$ | 13050 |
|  | Mol. wt. 229 | |
| Metanilic acid, 6-ethoxy- | $C_8H_{11}NO_4S$ | 15615 |
|  | Mol. wt. 217 | |
| Metanilic acid, 6-(<i>N</i> -ethylacetamido)- | $C_{10}H_{14}N_2O_4S$ | 17050 |
|  | Mol. wt. 258 | |
| Metanilic acid, <i>N</i> -ethyl- <i>N</i> -(<i>m</i> -sulfobenzyl)- | $C_{15}H_{17}NO_6S_2$ | 42571 |
|  | Mol. wt. 371 | |
| Metanilic acid, 4-methoxy- | $C_7H_9NO_4S$ | 17620 20250, 26580, 29225 |
|  | Mol. wt. 203 | |
| Metanilic acid, 6-methoxy- | $C_7H_9NO_4S$ | 14075 |
|  | Mol. wt. 203 | |
| Metanilic acid, 4-methoxy-6-nitro- | $C_7H_8N_2O_6S$ | 25410 |
|  | Mol. wt. 203 | |
| Metanilic acid, 6,6'-oxydi- | $C_{12}H_{12}N_2O_7S_2$ | 25090 |
|  | Mol. wt. 360 | |
| Metanilic acid, 6-phenoxy- | $C_{12}H_{11}NO_4S$ | 27010 |
|  | Mol. wt. 265 | |
| Metanilic acid, <i>N</i> -phenyl- | $C_{12}H_{11}NO_3S$ | 42780 |
|  | Mol. wt. 249 | |
| Metanilic acid, 6,6'-thiodi- | $C_{12}H_{12}N_2O_6S_3$ | 25130, 25135 |
|  | Mol. wt. 376 | |
| Methane, chloro- | CH_3Cl | 42556, 42585, 48070 |
| CH_3Cl | Mol. wt. 50.5 | |
| | m.p. -103.6° b.p. -24.1° | |

Methane, dichloro(*p*-chlorophenyl)phenyl-

$C_{13}H_9Cl_3$

44500, 44515



Mol. wt. 271.5

Methane, dimethylamino-di-*o*-tolyl

See o-Toluidine, 4,4'-methylenebis[*N*-methyl-

Methane, iodo-

CH_3I

42530, 42556

CH_3I

Mol. wt. 142

m.p. -64.4°
b.p. 42.3°

Methane, nitro(*o*-nitrophenyl)-

See Toluene, *o,o*-dinitro-

Methanesulfonic acid, anilino-

$C_7H_9NO_3S$

35760, 35790

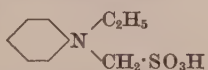


Mol. wt. 187

Methanesulfonic acid, (*N*-ethylanilino)-

$C_9H_{13}NO_3S$

13040

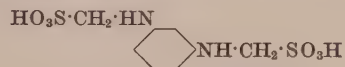


Mol. wt. 215

Methanesulfonic acid, (*m*-phenylenediimino)di-

$C_8H_{12}N_2O_6S_2$

35445



Mol. wt. 296

Methylamine

CH_5N

60505, 60715, 61105, 61500, 61505, 61510, 63305

CH_3NH_2

Mol. wt. 31

b.p. $-7.55^\circ/719$ mm.

Methyl chloride

See Methane, chloro-

Methyl iodide

See Methane, iodo-

Michler's Base

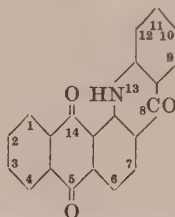
See Aniline, 4,4'-methylenebis[*N,N*-dimethyl-

N

Naphth[2,3-*c*]acridan-5,8,14-trione

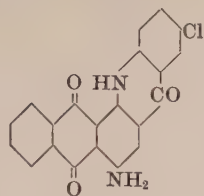
$C_{21}H_{11}NO_3$

67800



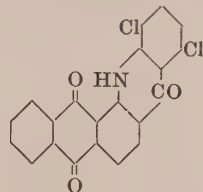
Mol. wt. 325

Naphth[2,3-*c*]acridan-5,8,14-trione,
6-amino-10-chloro- $C_{21}H_{11}ClN_2O_3$ 70700



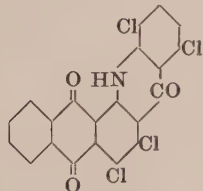
Mol. wt. 374.5

Naphth[2,3-*c*]acridan-5,8,14-trione,
9,12-dichloro- $C_{21}H_9Cl_2NO_3$ 70900



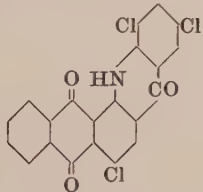
Mol. wt. 394

Naphth[2,3-*c*]acridan-5,8,14-trione,
6,7,9,12-tetrachloro- $C_{21}H_7Cl_4NO_3$ 70910



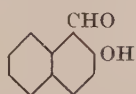
Mol. wt. 363

Naphth[2,3-*c*]acridan-5,8,14-trione,
6,10,12-trichloro- $C_{21}H_8Cl_3NO_3$ 70510



Mol. wt. 428.5

1-Naphthaldehyde, 2-hydroxy- $C_{11}H_8O_2$ 48052



Mol. wt. 172

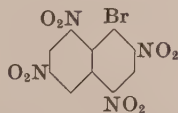
Naphthalene $C_{10}H_8$ 59000



Mol. wt. 128

m.p. 80.3°

Naphthalene, 1-bromo-2,4,6,8-tetranitro- $C_{10}H_3BrN_4O_8$ 10318



Mol. wt. 387

Naphthalene, 2-chloro- $C_{10}H_7Cl$ 66705, 66706



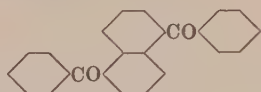
Mol. wt. 162.5

m.p. 61°

Naphthalene, 1,5-dibenzoyl-

$C_{24}H_{18}O_2$

59100



Mol. wt. 336

m.p. 185–186°

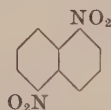
Naphthalene, 1,6-dihydroxy-

See 1,6-Naphthalenediol

Naphthalene, 1,5-dinitro-

$C_{10}H_6N_2O_4$

53270, 53271, 53272, 57010, 57011



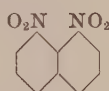
Mol. wt. 218

m.p. 216°

Naphthalene, 1,8-dinitro-

$C_{10}H_6N_2O_4$

57010, 53272, 53275



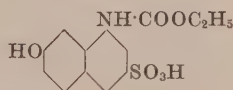
Mol. wt. 218

m.p. 173–173.5°

**1-Naphthalenecarbamic acid,
7-hydroxy-3-sulfo-, ethyl ester**

$C_{13}H_{13}NO_6S$

18170



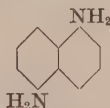
Mol. wt. 311

1,5-Naphthalenediamine

$C_{10}H_{10}N_2$

21650

76595



Mol. wt. 158

m.p. 189–190°

2,6-Naphthalenediamine

$C_{10}H_{10}N_2$

76600



Mol. wt. 158

m.p. 216–217°

2,6-Naphthalenediamine, N,N'-diphenyl-

$C_{22}H_{18}N_2$

50155



Mol. wt. 310

m.p. 210°

2,7-Naphthalenediamine

$C_{10}H_{10}N_2$

30275



Mol. wt. 158

m.p. 166°

2,7-Naphthalenediamine, N,N'-di-p-tolyl-

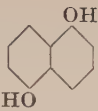
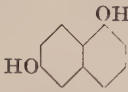
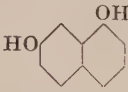



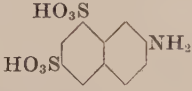
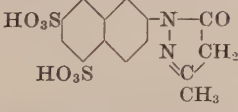
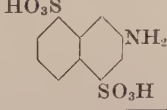
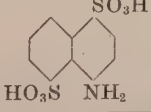
$C_{24}H_{22}N_2$

50160, 50165



Mol. wt. 338

m.p. 236–237°

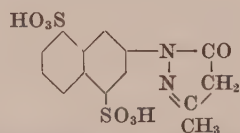
| | | | |
|---|---|---|--|
| 1,5-Naphthalenediol |  | $C_{10}H_8O_2$ Mol. wt. 160 m.p. 265° | 76625 16500, 16505, 16510 |
| 1,6-Naphthalenediol |  | $C_{10}H_8O_2$ Mol. wt. 160 m.p. 136–138° | 45460 76630 |
| 1,7-Naphthalenediol |  | $C_{10}H_8O_2$ Mol. wt. 160 m.p. 178° | 76635 |
| 2,6-Naphthalenediol |  | $C_{10}H_8O_2$ Mol. wt. 160 m.p. 218° | 76640 |
| 2,7-Naphthalenediol |  | $C_{10}H_8O_2$ Mol. wt. 160 m.p. 184–185° | 10015 16720 22285 51205 76645 |
| Naphthalenedisulfonic acid, amino- (unspecified) | | $C_{10}H_9NO_6S_2$ | 28395 |
| 1,3-Naphthalenedisulfonic acid, 6-amino- |  | $C_{10}H_9NO_6S_2$ Mol. wt. 303 | 14200 22180 34285, 34300 |
| 1,3-Naphthalenedisulfonic acid, 7-amino- |  | $C_{10}H_9NO_6S_2$ Mol. wt. 303 | 14110 26980, 27260, 27300, 28255 30115 35790, 35800 |
| 1,3-Naphthalenedisulfonic acid, 6-(3-methyl-5-oxo-2-pyrazolin-1-yl)- |  | $C_{14}H_{12}N_2O_7S_2$ Mol. wt. 384 | 22380 |
| 1,5-Naphthalenedisulfonic acid, 3-amino- |  | $C_{10}H_9NO_6S_2$ Mol. wt. 303 | 13190, 13245, 14115 27860, 27915, 27945, 28260, 28340, 29025, 29030, 29060 34005, 34010, 34015, 34020, 34140, 34179, 34180, 34210, 34300 35865, 35870 |
| 1,5-Naphthalenedisulfonic acid, 4-amino- |  | $C_{10}H_9NO_6S_2$ Mol. wt. 303 | 27240 |

**1,5-Naphthalenedisulfonic acid,
3-(3-methyl-5-oxo-2-pyrazolin-1-yl)-**

$C_{14}H_{12}N_2O_7S_2$

19050
22385

Mol. wt. 384

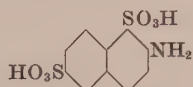


1,6-Naphthalenedisulfonic acid, 2-amino-

$C_{10}H_8NO_6S_2$

16190

Mol. wt. 303

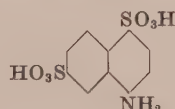


1,6-Naphthalenedisulfonic acid, 4-amino-

$C_{10}H_8NO_6S_2$

13370
27240, 27645, 27940, 29055, 29206
44030

Mol. wt. 303

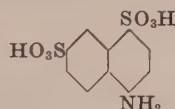


1,7-Naphthalenedisulfonic acid, 4-amino-

$C_{10}H_8NO_6S_2$

13370
29055

Mol. wt. 303

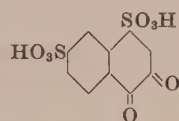


**1,7-Naphthalenedisulfonic acid,
3,4-dihydro-3,4-dioxo-**

$C_{10}H_6O_8S_2$

52050

Mol. wt. 318



2,6-Naphthalenedisulfonic acid, 3-amino-

$C_{10}H_8NO_6S_2$

13435

Mol. wt. 303

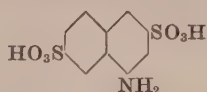


2,6-Naphthalenedisulfonic acid, 4-amino-

$C_{10}H_8NO_6S_2$

13350
26300, 26945, 27090, 27245, 29050

Mol. wt. 303

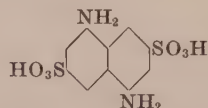


**2,6-Naphthalenedisulfonic acid,
4,8-diamino-**

$C_{10}H_{10}N_2O_6S_2$

21680, 21690, 21700, 21710
35130, 36210, 36300

Mol. wt. 318



2,7-Naphthalenedisulfonic acid

$C_{10}H_8O_6S_2$

44025

Mol. wt. 288







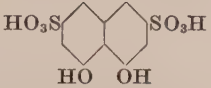
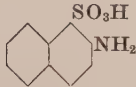
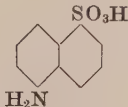
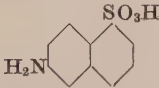

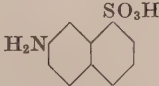
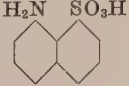
2,7-Naphthalenedisulfonic acid, 1-amino-

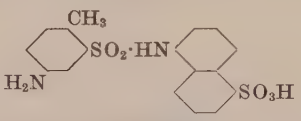
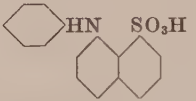
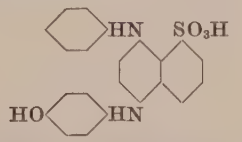
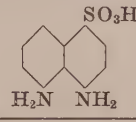
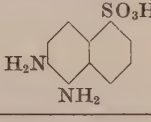
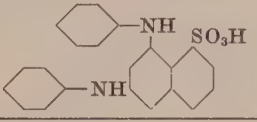
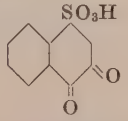
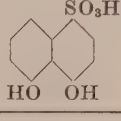
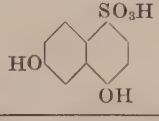
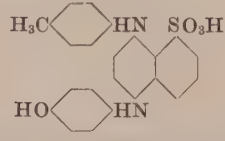
$C_{10}H_9NO_6S_2$


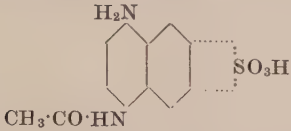
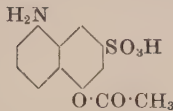
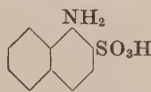
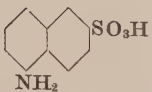




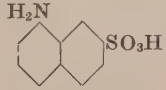
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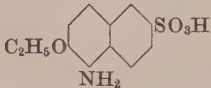
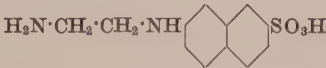
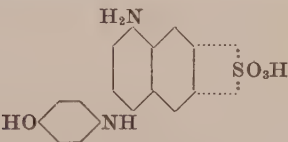

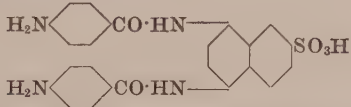
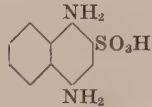
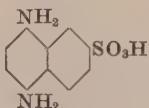
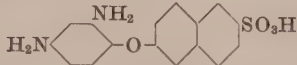
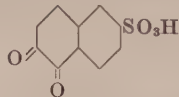
Mol. wt. 303

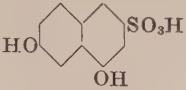
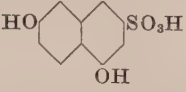


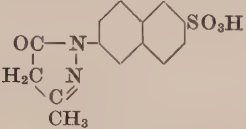

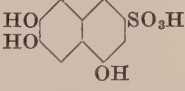
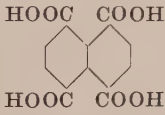
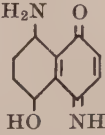
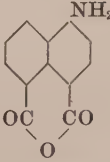


| | | |
|---|---|---|
| 2,7-Naphthalenedisulfonic acid, 3-amino- | $C_{10}H_9NO_6S_2$ | 13440, 13445, 13450, 14925, 16295 22070, 22160, 22190, 22195, 22200, 22205, 22850, 23050, 23510, 23570, 23585, 23600, 23605 |
|  | Mol. wt. 303 | |
| 2,7-Naphthalenedisulfonic acid, 4-amino- | $C_{10}H_9NO_6S_2$ | 13350 26270, 26300, 26945, 27090, 27245, 27275 |
|  | Mol. wt. 303 | |
| 2,7-Naphthalenedisulfonic acid, 3,6-diamino- | $C_{10}H_{10}N_2O_6S_2$ | 22210 |
|  | Mol. wt. 318 | |
| 2,7-Naphthalenedisulfonic acid, 4,5-diamino- | $C_{10}H_{10}N_2O_6S_2$ | 19520 20540 57030 |
|  | Mol. wt. 318 | |
| 2,7-Naphthalenedisulfonic acid, 4,5-dihydroxy- | $C_{10}H_8O_8S_2$ | 16570, 16575, 16580, 16585, 16590, 16595, 16600, 16605, 16610, 16620, 16625, 16630, 16640, 16645, 16670, 16675, 16680, 16685, 16690 |
|  | Mol. wt. 320 | 21555, 21590, 22490, 22540, 23160, 23690, 23790, 23795, 24340, 24345, 24350, 24355, 25310, 27560 30180, 31645, 31800, 31815, 35295, 35315 |
| 1-Naphthalenesulfonic acid, 2-amino- | $C_{10}H_9NO_3S$ | 15630, 15880, 18930, 19040 40645 68000 |
|  | Mol. wt. 223 | |
| 1-Naphthalenesulfonic acid, 4-amino- | | |
| <i>See Naphthionic acid</i> | | |
| 1-Naphthalenesulfonic acid, 5-amino- | $C_{10}H_9NO_3S$ | 13185, 13365, 15625, 16256 20110, 23530, 26315, 26370, 26405, 29215 30160, 30270, 31730 44020 |
|  | Mol. wt. 223 m.p. 189.5 | |
| 1-Naphthalenesulfonic acid, 6-amino- | $C_{10}H_9NO_3S$ | 13115, 13425 24870, 28290, 29220 40647 |
|  | Mol. wt. 223 (decomp.) | |
| 1-Naphthalenesulfonic acid, 6(and 7)-amino- | $C_{10}H_9NO_3S$ | 14100, 14225, 14725, 15635 20220, 27255, 27515, 28145, 28330 |
|  | Mol. wt. 223 | |
| 1-Naphthalenesulfonic acid, 7-amino- | $C_{10}H_9NO_3S$ | 27540, 28455 34270 |
|  | Mol. wt. 223 | |
| 1-Naphthalenesulfonic acid, 8-amino- | $C_{10}H_9NO_3S$ | 26320 53590 |
|  | Mol. wt. 223 m.p. 130° (- H ₂ O) | |

| | | |
|---|-------------------------|--|
| 1-Naphthalenesulfonic acid, 5-(5-amino-o-tolylsulfonamido)- | $C_{17}H_{16}N_2O_5S_2$ | 19300 |
|  | Mol. wt. 392 | |
| 1-Naphthalenesulfonic acid, 8-anilino- | $C_{16}H_{13}NO_3S$ | 13380, 13385, 13390 26350, 26360, 26361, 26365, 26370, 26380 |
|  | Mol. wt. 299 | |
| 1-Naphthalenesulfonic acid, 8-anilino-5-(p-hydroxyanilino)- | $C_{22}H_{18}N_2O_4$ | 53570, 53571, 53572, 53573 |
|  | Mol. wt. 406 | |
| 1-Naphthalenesulfonic acid, 4,5-diamino- | $C_{10}H_{10}N_2O_3S$ | 19510, 19515 |
|  | Mol. wt. 286 | |
| 1-Naphthalenesulfonic acid, 5,6-diamino- | $C_{10}H_{10}N_2O_3S$ | 49415 |
|  | Mol. wt. 206 | |
| 1-Naphthalenesulfonic acid, 6,8-dianilino- | $C_{22}H_{18}N_2O_3S$ | 50315, 50320, 50325, 50330 |
|  | Mol. wt. 390 | |
| 1-Naphthalenesulfonic acid, 3,4-dihydro-3,4-dioxo- | $C_{10}H_6O_5S$ | 51405, 51410 |
|  | Mol. wt. 238 | |
| 1-Naphthalenesulfonic acid, 4,5-dihydroxy- | $C_{10}H_8O_5S$ | 16530, 16535, 16540, 16545, 16550, 16555 . 24335, 27500, 27510, 27515, 27520, 27530, 27540 30175, 30375, 31680, 31775, 31870, 31880, 31890, 31920, 31925, 31930 |
|  | Mol. wt. 240 | |
| 1-Naphthalenesulfonic acid, 4,6-dihydroxy- | $C_{10}H_8O_5S$ | 24080, 24325, 24790, 24800, 24810 |
|  | Mol. wt. 240 | |
| 1-Naphthalenesulfonic acid, 5-(p-hydroxyanilino)-8-p-toluidino- | $C_{23}H_{20}N_2O_4S$ | 53580, 53581 |
|  | Mol. wt. 420 | |

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|--|---------------------------------------|--|
| 1-Naphthalenesulfonic acid, 8-<i>p</i>-toluidino-  | $C_{17}H_{15}NO_3S$ Mol. wt. 313 | 13400, 13405 26400, 26405, 26410 |
| 2-Naphthalenesulfonic acid, 5(and 8)-acetamido-8(and 5)-amino-  | $C_{12}H_{12}N_2O_4S$ Mol. wt. 280 | 27095, 27250, 27725 32050, 32055, 34280, 35510 |
| 2-Naphthalenesulfonic acid, 4-acetoxy-8-amino-  | $C_{12}H_{11}NO_5S$ Mol. wt. 281 | 28290 |
| 2-Naphthalenesulfonic acid, 1-amino-  | $C_{10}H_9NO_3S$ Mol. wt. 223 | 27910 44035 |
| 2-Naphthalenesulfonic acid, 5-amino-  | $C_{10}H_9NO_3S$ Mol. wt. 223 | 22035, 23540, 26230, 26510, 26530, 26531, 26650, 26705, 27660 31546, 31640, 31680, 31695, 31725, 32055, 34035, 34080, 34085, 34090, 34095, 34138, 34145, 34175, 34180, 34205, 34220, 34225, 34280, 34290 35760 |
| 2-Naphthalenesulfonic acid, 5(and 8)-amino-  | $C_{10}H_9NO_3S$ Mol. wt. 223 | 20151, 21540, 24110, 26200, 26440, 26550, 26965, 27270, 27275, 27530, 27960, 27990 30015, 31546, 31555, 31560, 31565, 31570, 31575, 31585, 31590, 31595, 31600, 31625, 31630, 31635, 31670, 31675, 31700, 31715, 31720, 31730, 31735, 31745, 31785, 31790, 33530, 34005, 34010, 34100, 34125, 34146, 34150, 34170 35200, 35460, 35500, 35710, 35715, 35750, 35850, 36000, 36030, 36300, 36310, 36311 44080 |
| 2-Naphthalenesulfonic acid, 6-amino-  | $C_{10}H_9NO_3S$ Mol. wt. 223 | 13000, 14095, 14230, 14630, 14730, 15640 21545, 22160, 22165, 23045, 23505, 23560, 23565, 23570, 24000, 24875, 24880, 29165, 29180, 29200 |
| 2-Naphthalenesulfonic acid, 6(and 7)-amino-  | $C_{10}H_9NO_3S$ Mol. wt. 223 | 14105 22170, 26420, 29195 |
| 2-Naphthalenesulfonic acid, 7-amino-  | $C_{10}H_9NO_3S$ Mol. wt. 223 | 13430 22175, 23565, 23580, 23585, 23590, 23595, 24000, 24880, 26430 |
| 2-Naphthalenesulfonic acid, 8-amino-  | $C_{10}H_9NO_3S$ Mol. wt. 223 | 14840 20125, 21630, 24115, 26305, 26310, 26315, 26380, 26410, 26960, 27665, 27740, 27755, 28440 31580, 31725, 31770, 31775, 31880, 31925, 31945, 33565, 34025, 34050, 34095, 34130, 34135, 34139, 34140, 34179, 34180, 34200, 34210, 34215, 34225, 34260 35810, 35860, 35865, 35870 |

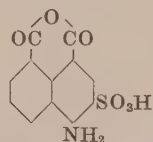
| | | |
|---|-----------------------|---|
| 2-Naphthalenesulfonic acid, 5-amino-6-ethoxy- | $C_{12}H_{13}NO_4S$ | 13480 27110, 27115, 27970, 28280, 28430, 28470, 28480 31980, 31985, 32030, 34230, 34260, 34270, 34295 |
|  | Mol. wt. 267 | |
| 2-Naphthalenesulfonic acid, 7-(2-aminoethylamino)- | $C_{13}H_{14}N_2O_3S$ | 13470 |
|  | Mol. wt. 266 | |
| 2-Naphthalenesulfonic acid, 5(and 8)-amino-8(and 5)-(p-hydroxyanilino)- | $C_{16}H_{14}N_2O_4S$ | 53540, 53541 |
|  | Mol. wt. 330 | |
| 2-Naphthalenesulfonic acid, 5(and 8)-amino-8(and 5)-nitro- | $C_{10}H_8N_2O_5S$ | 26680, 27050, 27140 |
|  | Mol. wt. 268 | |
| 2-Naphthalenesulfonic acid, 5,8-bis(p-aminobenzamido)- | $C_{24}H_{20}N_4O_5S$ | 25250 |
|  | Mol. wt. 476 | |
| 2-Naphthalenesulfonic acid, 1,4-diamino- | $C_{10}H_{10}N_2O_3S$ | 21660, 21670 32045 |
|  | Mol. wt. 238 | |
| 2-Naphthalenesulfonic acid, 5,8-diamino- | $C_{10}H_{10}N_2O_3S$ | For derived dyes <i>see</i> 2-Naphthalenesulfonic acid, 5(and 8)-acetamido-8(and 5)-amino- |
|  | Mol. wt. 238 | |
| 2-Naphthalenesulfonic acid, 6-(2,4-diaminophenoxy)- | $C_{16}H_{14}N_2O_4S$ | 13310 |
|  | Mol. wt. 330 | |
| 2-Naphthalenesulfonic acid, 5,6-dihydro-5,6-dioxo- | $C_{10}H_6O_5S$ | 52055 |
|  | Mol. wt. 238 | |

| | | |
|---|-------------------------|-------------------------------------|
| 2-Naphthalenesulfonic acid, 4,6-dihydroxy- | $C_{10}H_8O_5S$ | 16700, 16705, 16710, 16711 34100 |
|  | Mol. wt. 240 | |
| 2-Naphthalenesulfonic acid, 4,7-dihydroxy- | $C_{10}H_8O_5S$ | 22290 |
|  | Mol. wt. 240 | |
| 2-Naphthalenesulfonic acid, 7-ethylamino- | $C_{12}H_{13}NO_3S$ | 23595, 23610, 24120 |
|  | Mol. wt. 251 | |
| 2-Naphthalenesulfonic acid, 7-methylamino- | $C_{11}H_{11}NO_3S$ | 23590, 25375, 26430 |
|  | Mol. wt. 237 | |
| 2-Naphthalenesulfonic acid, 6-(3-methyl-5-oxo-2-pyrazolin-1-yl)- | $C_{14}H_{12}N_2O_4S$ | 22770 |
|  | Mol. wt. 304 | |
| 2-Naphthalenesulfonic acid, 6,6'(or 7,7')-(m-phenylenediimino)di- | $C_{28}H_{20}N_2O_6S_2$ | 50270, 52065 |
|  | Mol. wt. 520 | |
| 2-Naphthalenesulfonic acid, 4,6,7-trihydroxy- | $C_{10}H_8O_6S$ | 16730 |
|  | Mol. wt. 256 | |
| 1,4,5,8-Naphthalenetetracarboxylic acid | $C_{14}H_8O_8$ | 71000, 71005, 71110, 71115, 71120 |
|  | Mol. wt. 304 | |
| 1(4H)-Naphthalenone, 8-amino-5-hydroxy-4-imino- | $C_{10}H_8N_2O_2$ | 56055, 56060 |
|  | Mol. wt. 188 | |
| Naphthalic anhydride, 4-amino- | $C_{12}H_7NO_3$ | 56200 |
|  | Mol. wt. 198 | |

Naphthalic anhydride, 4-amino-3-sulfo-

 $C_{12}H_7NO_6S$

56205, 56210

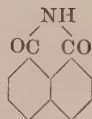


Mol. wt. 293

Naphthalimide

 $C_{12}H_7NO_2$

, 71129, 71130, 71145



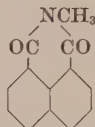
Mol. wt. 197

m.p. 300°

Naphthalimide, N-methyl-

 $C_{13}H_9NO_2$

71130



Mol. wt. 211

m.p. 205°

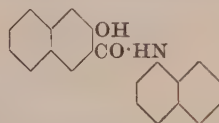
2-Naphthamide, N,N'-(3,3'-dimethoxy-4,4'-biphenylene)bis[3-hydroxy-

See 4',4'''-Bi-2-naphth-o-anisidine, 3,3''-dihydroxy-

2-Naphthamide, N,N'-(3,3'-dimethyl-4,4'-biphenylene)bis[3-hydroxy-

See 4',4'''-Bi-2-naphtho-o-toluidide, 3,3''-dihydroxy-

2-Naphthamide, 3-hydroxy-N-1-naphthyl-

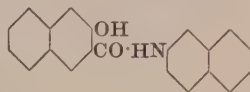
 $C_{21}H_{15}NO_2$ 12500, 12505
37560

Mol. wt. 309

2-Naphthamide, 3-hydroxy-N-2-naphthyl-

 $C_{21}H_{15}NO_2$

37565



Mol. wt. 309

2-Naphthanilide, 4'-chloro-3-hydroxy-

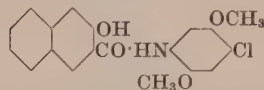
 $C_{17}H_{12}ClNO_2$ 12330, 12335
37510

Mol. wt. 297.5

2-Naphthanilide, 4'-chloro-3-hydroxy-2',5'-dimethoxy-

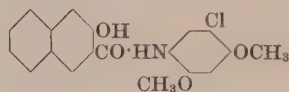
 $C_{19}H_{16}ClNO_4$

37555



Mol. wt. 357.5

2-Naphthanilide, 5'-chloro-3-hydroxy-2',4'-dimethoxy-

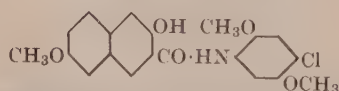
 $C_{19}H_{16}ClNO_4$ 12490
37550

Mol. wt. 357.5

2-Naphthanilide, 4'-chloro-3-hydroxy-2',5',7-trimethoxy-

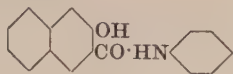
 $C_{20}H_{18}ClNO_5$

37569



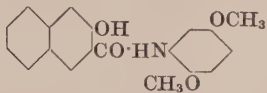
Mol. wt. 387.5

2-Naphthanilide, 3-hydroxy- $C_{17}H_{13}NO_2$ 12300, 12305, 12310, 12315, 12320, 12321
21180, 22900
37510



Mol. wt. 263

2-Naphthanilide, 3-hydroxy-2',5'-dimethoxy- $C_{19}H_{17}NO_4$ 12480
37545



Mol. wt. 323

2-Naphthanilide, 3-hydroxy-7-methoxy- $C_{18}H_{15}NO_3$ 37567

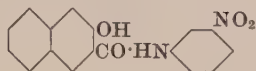


Mol. wt. 293

2-Naphthanilide, 3-hydroxy-2',3'-dimethyl-

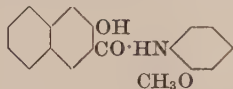
See 2-Naphtho-2,3-xylylide, 3-hydroxy-

2-Naphthanilide, 3-hydroxy-3'-nitro- $C_{17}H_{12}N_2O_4$ 12350, 12351, 12355, 12360
37515



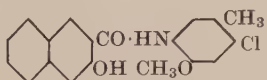
Mol. wt. 308

2-Naphth-o-aniside, 3-hydroxy- $C_{18}H_{15}NO_3$ 12460, 12465
21185
37530



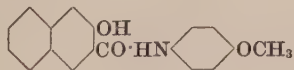
Mol. wt. 293

2-Naphth-o-aniside, 3-hydroxy-4'-chloro-5'-methyl- $C_{19}H_{16}ClNO_3$ 37541



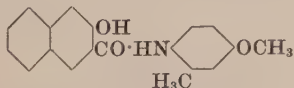
Mol. wt. 341.5

2-Naphth-p-aniside, 3-hydroxy- $C_{18}H_{15}NO_3$ 37535



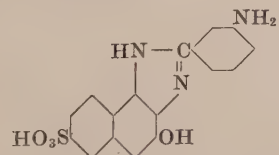
Mol. wt. 293

2-Naphth-p-aniside, 3-hydroxy-2'-methyl- $C_{19}H_{17}NO_3$ 37540



Mol. wt. 307

1H-Naphth[1,2]imidazole-7-sulfonic acid, 2-(m-aminophenyl)-4-hydroxy- $C_{17}H_{13}N_3O_4S$ 28700



Mol. wt. 356

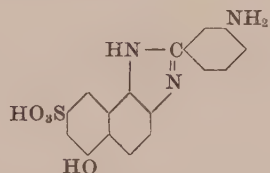
**1*H*-Naphth[1,2]imidazole-8-sulfonic acid,
2-(*m*-aminophenyl)-6-hydroxy-**

C₁₇H₁₃N₃O₄S

19500, 19505

24365, 26575, 26580, 26720, 26725, 26730, 27130, 27780, 28705
34060

Mol. wt. 355

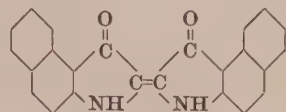


β-Naphthindigo

C₂₄H₁₄N₂O₂

73115

Mol. wt. 362

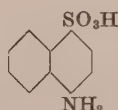


Naphthionic acid

C₁₀H₉NO₃S

10370

Mol. wt. 223



13001, 13240, 13355, 13360, 13361, 14090, 14160, 14220, 14625,
14720, 14835, 14915, 14975, 15620, 16045, 16046, 16047,
16050, 16185, 16255, 16290, 16645, 16720, 17190, 19235
20075, 20090, 20091, 20095, 20100, 20190, 20195, 21650, 22000,
22030, 22090, 22120, 22125, 22130, 22135, 22140, 22145,
22150, 22155, 23040, 23500, 23505, 23510, 23515, 23520,
24100, 24105, 25290, 25450, 26200, 26230, 26310, 26990,
27970, 29190, 34907
30000, 30010, 30030, 30040, 30055, 30105, 30155, 30170, 30175,
30180, 30265, 30370, 30375
35010, 35040, 35045, 35060, 35230, 35650, 35660, 35670, 35680,
36010, 36320
44020

β-Naphthisatin

See 3*H*-Benz[*e*]indole-1,2-dione

Naphthisatin-α-chloride, 9-chloro-

See 3*H*-Benz[*f*]indol-3-one, 2,9-dichloro-

2-Naphthoic acid, 7-bromo-3-hydroxy-

C₁₁H₇BrO₃

37566

Mol. wt. 267

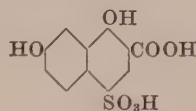


2-Naphthoic acid, 1,7-dihydroxy-4-sulfo-

C₁₁H₈O₇S

23695, 23780, 24160, 24320, 24330

Mol. wt. 284

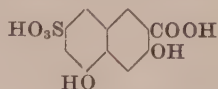


2-Naphthoic acid, 3,5-dihydroxy-7-sulfo-

C₁₁H₈O₇S

22545, 22790, 23700, 23785, 24165

Mol. wt. 284



2-Naphthoic acid, 1-hydroxy-

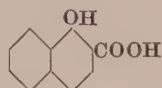
C₁₁H₈O₃

14655





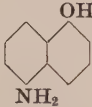
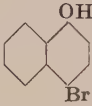
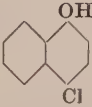
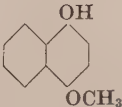
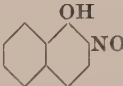
21575



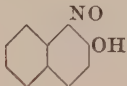
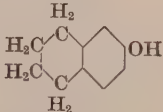
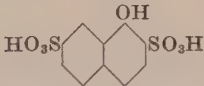
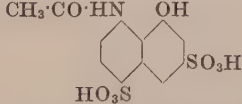
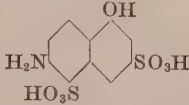
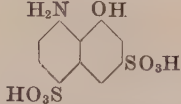
44010, 44530, 44535

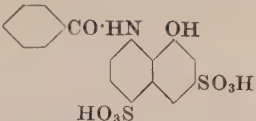
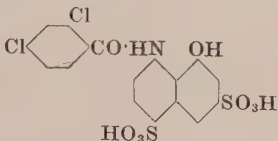
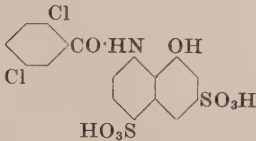
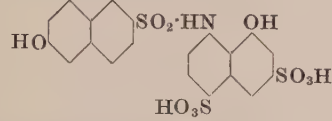
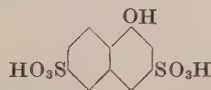
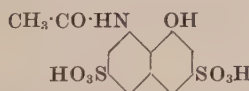


Mol. wt. 188

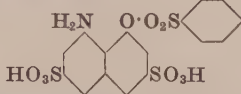
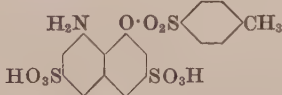
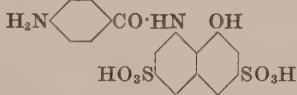
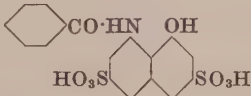
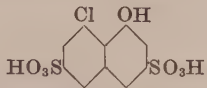
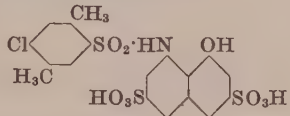
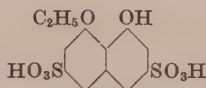
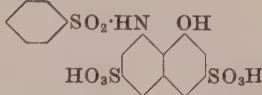
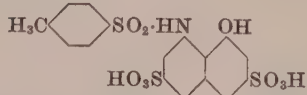
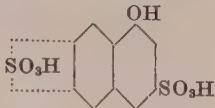



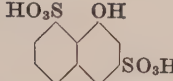
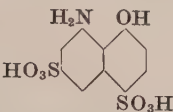
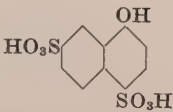
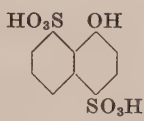
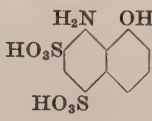


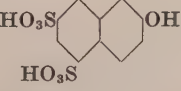
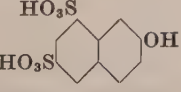
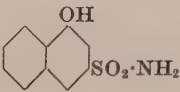
m.p. 187°

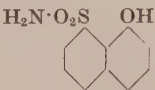
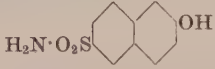
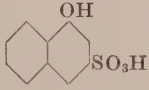
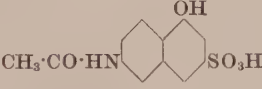
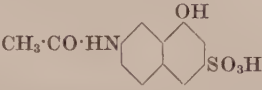
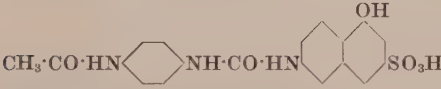
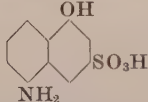
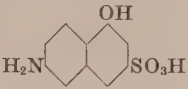
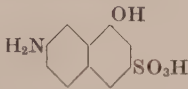
| | | | |
|--|---|--|--|
| 2-Naphthoic acid, 3-hydroxy- |  | $C_{11}H_8O_3$ Mol. wt. 188 m.p. 216° | 15825, 15826, 15840, 15850, 15851, 15860, 15865, 15867, 15870, 15880 23760, 24290 37505 |
| 2-Naphthoic acid, 3-hydroxy-7-methoxy- |  | $C_{12}H_{10}O_4$ Mol. wt. 218 | 37567, 37568, 37569 |
| 2-Naphthoic acid, 1-hydroxy-7-sulfo- |  | $C_{11}H_8O_6S$ Mol. wt. 268 | 44015 |
| 1-Naphthol |  | $C_{10}H_8O$ Mol. wt. 144 m.p. 94° | 10010, 10315 12000, 12005, 12010, 12020, 14600, 14610, 14615, 14625, 14630, 14640, 14641, 14645, 14646 20300, 20305 40015, 49700, 49705 73810, 73811, 73815, 76605 |
| 1-Naphthol, 5-amino- |  | $C_{10}H_9NO$ Mol. wt. 159 m.p. 158° | 17000 53285, 53286 76650 |
| 1-Naphthol, 4-bromo- |  | $C_{10}H_7BrO$ Mol. wt. 223 m.p. 127-128° | 73815 |
| 1-Naphthol, 4-chloro- |  | $C_{10}H_7ClO$ Mol. wt. 178.5 m.p. 120-121° | 73805, 73815 |
| 1-Naphthol, 4-methoxy- |  | $C_{11}H_{10}O_2$ Mol. wt. 174 m.p. 130-131° | 73835, 73840, 76620 |
| 1-Naphthol, 2-nitroso- |  | $C_{10}H_7NO_2$ Mol. wt. 173 m.p. 162-164° | 76610 |

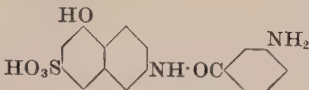
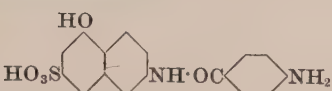
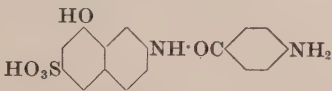
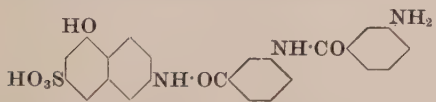
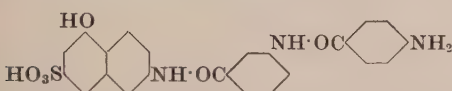
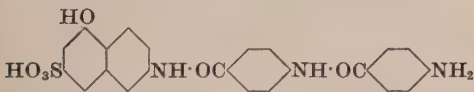
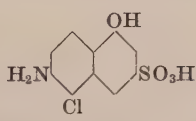
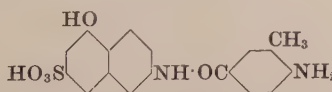
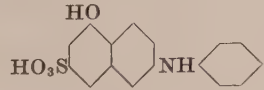
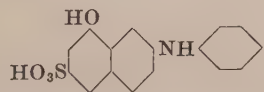
| | | | |
|---|---|-----------------------|---|
| 2-Naphthol |  | $C_{10}H_8O$ | 10005 12055, 12060, 12065, 12070, 12071, 12075, 12080, 12085, 12090, 12105, 12120, 12125, 12130, 12140, 12150, 12152, 12155, 12156, 12159, 12160, 12170, 12175, 12190, 12195, 12196, 12197, 12200, 12205, 12210, 12211 15500, 15505, 15510, 15511, 15515, 15520, 15525, 15530, 15540, 15550, 15555, 15570, 15575, 15580, 15585, 15590, 15595, 15600, 15602, 15603, 15610, 15615, 15620, 15625, 15630, 15635, 15640, 15660, 15670, 15675, 15680, 15681, 15685, 15690, 15691, 15695, 15700, 15705, 15706, 15707, 15708, 15710, 15711, 15715, 15720 21250, 21260, 21590, 21670, 21720, 21725, 22480, 22485, 22890, 22895, 23100, 23285, 23750, 23910, 24250, 24280, 24500, 24885, 25090, 26100, 26105, 26110, 26115, 26120, 26125, 26900, 26905, 26910, 26915, 26920, 26925, 26945, 26950, 26955, 26960, 26965, 26980, 26990 31900, 31950, 35415 37500 40015 44090, 50265, 51175, 51190, 53280, 53281 |
| 2-Naphthol, 7-amino- |  | $C_{10}H_9NO$ | 23730, 24210, 28670 |
| 2-Naphthol, 1-nitroso- |  | $C_{10}H_7NO_2$ | 22530 56050 |
| 2-Naphthol, 5,6,7,8-tetrahydro- |  | $C_{10}H_{12}O$ | 12050 |
| 1-Naphthol-2,7-disulfonic acid |  | $C_{10}H_8O_7S_2$ | 10316 |
| 1-Naphthol-3,5-disulfonic acid, 8-acetamido- |  | $C_{12}H_{11}NO_8S_2$ | 17970, 17975 24065, 24070, 28440 |
| 1-Naphthol-3,5-disulfonic acid, 6-amino- |  | $C_{10}H_9NO_7S_2$ | 17965 27760 |
| 1-Naphthol-3,5-disulfonic acid, 8-amino- |  | $C_{10}H_9NO_7S_2$ | 13400, 17150 20370, 20375, 20380, 20385, 20390, 20391, 20395, 21530, 22315, 22495, 22585, 22600, 22605, 24385, 25315 30020, 30225, 30230, 31620, 33540, 35256 |

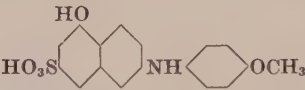
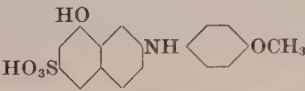
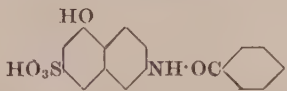
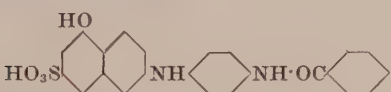
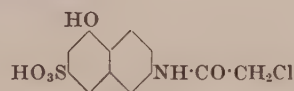
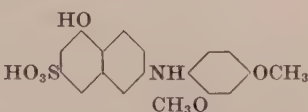
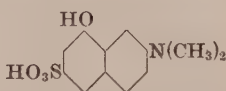
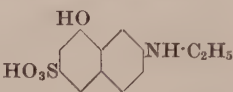
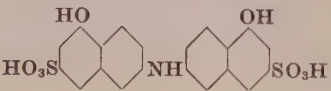
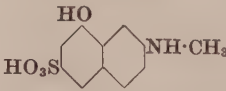
| | | |
|---|---------------------------|---|
| 1-Naphthol-3,5-disulfonic acid, 8-benzamido- | $C_{17}H_{13}NO_8S_2$ | 17990, 17995, 18000, 18001, 18005 |
|  | Mol. wt. 243 | |
| 1-Naphthol-3,5-disulfonic acid, 8-(2,4-dichlorobenzamido)- | $C_{17}H_{11}Cl_2NO_8S_2$ | 18020, 18025 |
|  | Mol. wt. 491 | |
| 1-Naphthol-3,5-disulfonic acid, 8-(2,5-dichlorobenzamido)- | $C_{17}H_{11}Cl_2NO_8S_2$ | 18030, 18035, 18040 |
|  | Mol. wt. 491 | |
| 1-Naphthol-3,5-disulfonic acid, 8-(6-hydroxy-2-naphthylsulfonamido)- | $C_{20}H_{15}NO_{10}S_3$ | 20530 |
|  | | |
| 1-Naphthol-3,6-disulfonic acid | $C_{10}H_8O_7S_2$ | 14890, 14895, 14900, 14905, 14910, 14915, 14920, 14925, 18058, 18073, 18092 |
|  | Mol. wt. 304 | 22238, 22275, 22445, 22460, 22465, 23250, 23265, 23266, 23285, 23625, 23730, 24145, 24210, 24215, 26760, 26765, 26766, 26770 |
| 1-Naphthol-3,6-disulfonic acid, 8-acetamido- | $C_{12}H_{11}NO_8S_2$ | 18050, 18055, 18058, 18060, 18065, 18070, 18073, 18075, 18080, 18090, 18092, 18095, 18100 |
|  | Mol. wt. 361 | 28450, 28455 32030, 34270 |
| 1-Naphthol-3,6-disulfonic acid, 7-amino- | $C_{10}H_9NO_7S_2$ | 17160, 17165, 17170 |
|  | Mol. wt. 319 | 22050, 22320, 25320, 27755 30065, 30080, 31685, 31820, 31835, 31875, 31940 35420, 35540, 35650, 35660, 35670, 35680 |
| 1-Naphthol-3,6-disulfonic acid, 8-amino- | $C_{10}H_9NO_7S_2$ | 13375, 13390, 13405, 17000, 17180, 17185, 17190, 17200, 17205, 17220, 17225, 17230, 17235, 17236, 17240, 18155, 18156, 18157, 18158, 18159, 18165, 18205, 18245 |
|  | Mol. wt. 319 | 20410, 20415, 20420, 20425, 20430, 20435, 20440, 20450, 20460, 20470, 20475, 20480, 20485, 20490, 20495, 20496, 20500, 20510, 22045, 22046, 22110, 22230, 22455, 22485, 22495, 22565, 22590, 22595, 22610, 22620, 23390, 23400, 23550, 23675, 23710, 23820, 23835, 23850, 24090, 24330, 24390, 24400, 24405, 25055, 25060, 25280, 26990, 27790, 27865, 27950, 28500 |
| <i>See also 1-Naphthol-3,6-disulfonic acid, 8-amino-, benzenesulfonate and 1-Naphthol-3,6-disulfonic acid, 8-amino-, p-toluenesulfonate</i> | | 30025, 30085, 30090, 30130, 30205, 30235, 30240, 30245, 30250, 30255, 30260, 30265, 30270, 30275, 30280, 30285, 30290, 30295, 30300, 30305, 30310, 30315, 30320, 30325, 30330, 30335, 30336, 30340, 30345, 30350, 30355, 30390, 30395, 31520, 31530, 31615, 31710, 31755, 31765, 31793, 31835, 31840, 31845, 31850, 31855, 31885, 32000, 33520, 33545, 34040, 34045, 34215, 34900, 34905, 34907 |
| | | 35075, 35210, 35255, 35260, 35265, 35270, 35275, 35415, 35460, 35520, 35530, 35535, 35570, 35720, 36020, 36250 |
| | | 57030 |

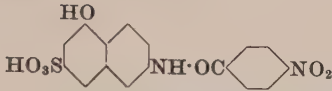
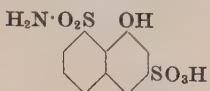
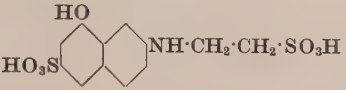
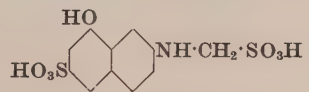
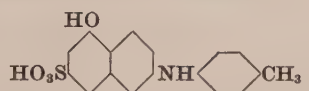
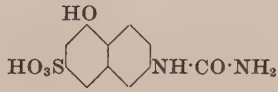

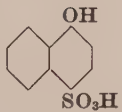
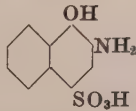
| | | |
|---|-------------------------|---|
| 1-Naphthol-3,6-disulfonic acid, 8-amino-, benzenesulfonate | $C_{16}H_{13}NO_9S_3$ | 27925 34215 |
|  | Mol. wt. 459 | |
| 1-Naphthol-3,6-disulfonic acid, 8-amino-, p-toluenesulfonate | $C_{17}H_{15}NO_9S_3$ | 17190 29065 |
|  | Mol. wt. 477 | |
| 1-Naphthol-3,6-disulfonic acid, 8-(p-aminobenzamido)- | $C_{17}H_{14}N_2O_8S_2$ | 28480 |
|  | Mol. wt. 438 | |
| 1-Naphthol-3,6-disulfonic acid, 8-benzamido- | $C_{17}H_{13}NO_8S_2$ | 18105 28480 |
|  | | |
| 1-Naphthol-3,6-disulfonic acid, 8-chloro- | $C_{10}H_7ClO_7S_2$ | 15070, 15075 24150, 24270 |
|  | Mol. wt. 308.8 | |
| 1-Naphthol-3,6-disulfonic acid, 8-(4-chloro-2,5-xylylsulfonamido)- | $C_{17}H_{16}ClNO_9S_3$ | 18150 |
|  | Mol. wt. 509.5 | |
| 1-Naphthol-3,6-disulfonic acid, 8-ethoxy- | $C_{12}H_{12}O_8S_2$ | 15080, 15085 23005, 23015 |
|  | Mol. wt. 348 | |
| 1-Naphthol-3,6-disulfonic acid, 8-phenylsulfonamido- | $C_{16}H_{13}NO_9S_3$ | 18125, 18130 |
|  | Mol. wt. 459 | |
| 1-Naphthol-3,6-disulfonic acid, 8-p-tolylsulfonamido- | $C_{17}H_{15}NO_9S_3$ | 18110, 18115, 18120, 18125, 18129, 18130, 18133, 18134, 18135 |
|  | Mol. wt. 473 | |
| 1-Naphthol-3,6(and 3,7)-disulfonic acid | $C_{10}H_8O_7S_2$ | 14930 |
|  | Mol. wt. 304 | |

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| 1-Naphthol-3,7-disulfonic acid | $C_{10}H_8O_7S_2$ | 14940 |
|  | Mol. wt. 304 | |
| 1-Naphthol-3,8-disulfonic acid | $C_{10}H_8O_7S_2$ | 14950, 14955, 14960, 14965, 14970, 14975, 14980, 14985, 14990 22470, 22475, 23150, 23155, 23740, 23745, 24220, 24225, 24230 31910, 31955 |
|  | Mol. wt. 304 | |
| 1-Naphthol-4,6-disulfonic acid, 8-amino- | $C_{10}H_9NO_7S_2$ | 20520, 23840 30360 |
|  | Mol. wt. 319 | |
| 1-Naphthol-4,7-disulfonic acid | $C_{10}H_8O_7S_2$ | 10316 15000 24240 |
|  | Mol. wt. 304 | |
| 1-Naphthol-4,8-disulfonic acid | $C_{10}H_8O_7S_2$ | 10317 15010, 15015, 15020, 15025, 15030 24075, 26780, 26785 |
|  | Mol. wt. 304 | |
| 1-Naphthol-5,7-disulfonic acid, 8-amino- | $C_{10}H_9NO_7S_2$ | 17250, 17255, 17260 22625, 22800, 23860, 24280, 24395, 24410, 24411, 24415, 27780 31790 35465 |
|  | Mol. wt. 319 | |
| 2-Naphthol-3,6-disulfonic acid | $C_{10}H_8O_7S_2$ | 16105, 16110, 16115, 16120, 16130, 16140, 16149, 16150, 16151, 16152, 16155, 16160, 16165, 16180, 16185, 16190, 16200 21660, 21670, 22020, 22280, 23010, 23295, 24060, 24155, 24240, 24320, 24325, 24750, 24770, 24830, 24840, 25020, 27190, 27195, 27200, 27201, 27210, 27220, 27225, 27230, 27235, 27240, 27245, 27250, 27255, 27260, 27270, 27275 31770, 31805, 31915, 31960, 31965 44090, 44100 |
|  | Mol. wt. 304 | |
| 2-Naphthol-3,7-disulfonic acid | $C_{10}H_8O_7S_2$ | 24025, 24030 |
|  | Mol. wt. 304 | |
| 2-Naphthol-5,7-disulfonic acid | $C_{10}H_8O_7S_2$ | 16220 |
|  | Mol. wt. 304 | |
| 2-Naphthol-6,8-disulfonic acid | $C_{10}H_8O_7S_2$ | 16230, 16240, 16250, 16255, 16256, 16260, 16265, 16280 22240, 22245, 22510, 22520, 23255, 23260, 23630, 23635, 24125, 24780, 24785, 25050, 25115, 27290, 27291, 27300 44090 |
|  | Mol. wt. 304 | |
| 1-Naphthol-3-sulfonamide | $C_{10}H_9NO_3S$ | 15045 |
|  | Mol. wt. 223 | |

| | | |
|---|-----------------------|--|
| 1-Naphthol-8-sulfonamide | $C_{10}H_9NO_3S$ | 15050 |
|  | Mol. wt. 223 | |
| 2-Naphthol-6-sulfonamide | $C_{10}H_9NO_3S$ | 16310 |
|  | Mol. wt. 223 | |
| 1-Naphthol-3-sulfonic acid | $C_{10}H_8O_4S$ | 21580, 26650 34080 |
|  | Mol. wt. 224 | |
| 1-Naphthol-3-sulfonic acid, 6-acetamido- | $C_{12}H_{11}NO_5S$ | 17750, 17755, 17865 22420, 28100, 28105, 28110 35780 |
|  | Mol. wt. 281 | |
| 1-Naphthol-3-sulfonic acid, 7-acetamido- | $C_{12}H_{11}NO_5S$ | 17920, 17925, 17930 22360 |
|  | Mol. wt. 281 | |
| 1-Naphthol-3-sulfonic acid, 6-(p-acetamidophenylureido)- | $C_{19}H_{17}N_3O_6S$ | 17870, 17875, 17880 28370, 28375 |
|  | Mol. wt. 415 | |
| 1-Naphthol-3-sulfonic acid, 5-amino- | $C_{10}H_9NO_4S$ | 21600, 22300, 23810, 24170, 24200, 25270, 27665, 27740, 27770, 28290 34150 |
|  | Mol. wt. 239 | |
| 1-Naphthol-3-sulfonic acid, 6-amino- | $C_{10}H_9NO_4S$ | 17005, 17010, 17907, 17908, 17910, 17912, 17916 20320, 20325, 22170, 22180, 22200, 22305, 22306, 22405, 22415, 22460, 22550, 22555, 22565, 23110, 23165, 23705, 23820, 24175, 24220, 24345, 24360, 24361, 24365, 25000, 25005, 25275, 25280, 26210, 26540, 26545, 27600, 27625, 27640, 27645, 27660, 27665, 27680, 27685, 27750, 27920, 28685, 28710, 29250, 29255, 29260 30190, 30195, 30200, 30205, 30400, 31525, 31550, 31555, 31590, 31620, 31650, 31855, 33565, 34120, 34125, 34130, 34135, 34138, 34139, 34140, 34145, 34146, 34150, 34155, 34960 35080, 35085, 35110, 35400, 35430, 35530, 35730, 35810, 36020, 36250 |
|  | Mol. wt. 239 | |
| 1-Naphthol-3-sulfonic acid, 7-amino- | $C_{10}H_9NO_4S$ | 17020, 17025, 17030, 17035, 17040, 17045, 17047, 17050, 17055, 17060, 17065, 17070, 17075, 17080, 17100, 17105, 17110 21540, 21600, 21620, 22040, 22080, 22155, 22205, 22210, 22310, 22311, 22400, 22450, 22530, 22555, 22570, 22580, 22585, 22590, 22775, 23000, 23760, 23780, 23825, 24030, 24040, 24115, 24290, 24361, 24370, 24375, 25070, 25380, 25385, 25400, 25405, 26240, 26245, 27700, 27710, 27715, 27720, 27725, 27740, 27750 30060, 30075, 30090, 30125, 30130, 30340, 30345, 30365, 31510, 31515, 31535, 31540, 31545, 31546, 31560, 31565, 31570, 31575, 31580, 31585, 31590, 31595, 31600, 31605, 31610, 31630, 31655, 31660, 31665, 31690, 31705, 31750, 31780, 31785, 31810, 31815, 31820, 31825, 31830, 31860, 31890, 31930, 31935, 31951, 31970, 31995, 32000, 32005, 32010, 32015, 32020, 32025, 32045, 33525, 34000, 34170, 34175, 34179, 34180, 34280 35070, 35410, 35435, 35440, 35445, 35450, 35465, 35500, 35510, 35520, 35535, 35540, 35545, 35600, 35700, 35715, 35730, 35870, 36000, 36040 |
|  | Mol. wt. 239 | |

| | | |
|---|-----------------------|--|
| 1-Naphthol-3-sulfonic acid, 6-(<i>m</i>-aminobenzamido)- | $C_{17}H_{14}N_2O_5S$ | 17780, 17785 28210, 28211, 28215, 28220 34055, 34260 |
|  | Mol. wt. 358 | |
| 1-Naphthol-3-sulfonic acid, 6-(<i>p</i>-aminobenzamido)- | $C_{17}H_{14}N_2O_5S$ | 17805, 17810, 17815, 17820, 17895 25210, 25215, 25240, 26280, 28125, 28130, 28135, 28140, 28145, 28230, 28240, 28250, 28255, 28260, 28270, 28280, 28290, 28300, 28310, 28320, 28325, 28330, 28650, 28660, 28680, 34250, 34255, 34295 |
|  | Mol. wt. 358 | |
| 1-Naphthol-3-sulfonic acid, 7-(<i>p</i>-aminobenzamido)- | $C_{17}H_{14}N_2O_5S$ | 28320, 28325, 28330 |
|  | Mol. wt. 358 | |
| 1-Naphthol-3-sulfonic acid, 6-[<i>m</i>-(<i>m</i>-aminobenzamido)benzamido]- | $C_{24}H_{19}N_3O_6S$ | 17840, 17845 |
|  | Mol. wt. 477 | |
| 1-Naphthol-3-sulfonic acid, 6-[<i>p</i>-(<i>p</i>-aminobenzamido)benzamido]- | $C_{24}H_{19}N_3O_6S$ | 17860 26570, 28360 |
|  | Mol. wt. 477 | |
| 1-Naphthol-3-sulfonic acid, 6-[<i>p</i>-(<i>p</i>-aminobenzamido)benzamido]- | $C_{24}H_{19}N_3O_6S$ | 26715 |
|  | Mol. wt. 477 | |
| 1-Naphthol-3-sulfonic acid, 6-amino-5-chloro- | $C_{10}H_8ClNO_4S$ | 24550 |
|  | Mol. wt. 273.5 | |
| 1-Naphthol-3-sulfonic acid, 6-(4-amino-3-methylbenzamido)- | $C_{18}H_{16}N_2O_5S$ | 17830 28340 |
|  | Mol. wt. 372 | |
| 1-Naphthol-3-sulfonic acid, 6-anilino- | $C_{16}H_{13}NO_4S$ | 17500, 17510, 17515, 17520, 17525, 17596 22465, 22520, 22625, 22780, 23155, 23745, 24185, 24215, 24230, 24350, 24405, 24415, 25355, 25385, 25405, 27850, 27855, 27860, 27865, 27880, 27885, 27890, 27895, 27900, 27905, 27910, 27915, 27920, 27925, 27940, 27945, 27950, 27960, 27970 32055, 34200, 34205, 34210, 34215, 34220, 34225, 34230 |
|  | Mol. wt. 315 | |
| 1-Naphthol-3-sulfonic acid, 7-anilino- | $C_{16}H_{13}NO_4S$ | 17580, 17590, 17595, 17596, 17600, 17605, 17610, 17615, 17620, 17630 22345, 24195 31795 |
|  | Mol. wt. 315 | |

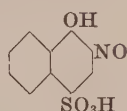
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| 1-Naphthol-3-sulfonic acid, 6-<i>p</i>-anisidino- | $C_{17}H_{15}NO_5S$ | 24555, 25420 |
|  | Mol. wt. 461 | |
| 1-Naphthol-3-sulfonic acid, 7-<i>p</i>-anisidino- | $C_{17}H_{15}NO_5S$ | 17640 |
|  | Mol. wt. 345 | |
| 1-Naphthol-3-sulfonic acid, 6-benzamido- | $C_{17}H_{13}NO_5S$ | 23650, 24560, 28160, 28165, 28170, 28175, 28180, 28190, 28200 |
|  | Mol. wt. 343 | |
| 1-Naphthol-3-sulfonic acid, 6-(<i>p</i>-benzamidoanilino)- | $C_{23}H_{18}N_2O_5S$ | 28350 |
|  | Mol. wt. 434 | |
| 1-Naphthol-3-sulfonic acid, 6-(2-chloroacetamido)- | $C_{12}H_{10}ClNO_3S$ | 17770 |
|  | Mol. wt. 315.5 | |
| 1-Naphthol-3-sulfonic acid, 6-(2,4-dimethoxyanilino)- | $C_{18}H_{17}NO_6S$ | 24560 |
|  | Mol. wt. 375 | |
| 1-Naphthol-3-sulfonic acid, 7-dimethylamino- | $C_{12}H_{13}NO_4S$ | 22340 |
|  | Mol. wt. 267 | |
| 1-Naphthol-3-sulfonic acid, 7-ethylamino- | $C_{12}H_{13}NO_4S$ | 22620, 22640 |
|  | Mol. wt. 267 | |
| 1-Naphthol-3-sulfonic acid, 6,6'-iminobis- | $C_{20}H_{15}NO_8S_2$ | 21580, 22930, 24355, 27990, 29100, 29105, 29110, 29115, 29120, 29125, 29128, 29130 |
|  | Mol. wt. 267 | 33560, 33565, 35290, 35295, 35300, 35770, 35775 |
| 1-Naphthol-3-sulfonic acid, 7-methylamino- | $C_{11}H_{11}NO_4S$ | 17540, 17550 22335 |
|  | Mol. wt. 257 | |

| | | |
|---|--|---|
| 1-Naphthol-3-sulfonic acid, 6-(<i>p</i>-nitrobenzamido)- | $C_{17}H_{12}N_2O_7S$ | 17800 |
|  | Mol. wt. 388 | |
| 1-Naphthol-3-sulfonic acid, 8-sulfamoyl- | $C_{10}H_9NO_6S_2$ | 15060 |
|  | Mol. wt. 303 | |
| 1-Naphthol-3-sulfonic acid, 7-(2-sulfoethylamino)- | $C_{12}H_{13}NO_7S_2$ | 17570 |
|  | Mol. wt. 347 | |
| 1-Naphthol-3-sulfonic acid, 7-(sulfomethylamino)- | $C_{11}H_{11}NO_7S_2$ | 17560 |
|  | Mol. wt. 307 | |
| 1-Naphthol-3-sulfonic acid, 6-<i>p</i>-toluidino- | $C_{17}H_{16}NO_4S$ | 24190 |
|  | Mol. wt. 329 | |
| 1-Naphthol-3-sulfonic acid, 6-ureido- | $C_{11}H_{10}N_2O_6S$ | 28120, 28125, 28130, 28135, 28140, 28145 34250, 34255 |
|  | Mol. wt. 282 | |
| 1-Naphthol-3-sulfonic acid, 6,6'-ureylenebis- | $C_{21}H_{16}N_2O_6S_2$ | 17890, 17895, 17900, 17905 28390, 28395, 28400, 29150, 29155, 29156, 29160, 29165, 29166, 29167, 29170, 29173, 29175, 29180, 29185, 29190, 29195, 29200, 29205, 29210, 29215, 29220, 29225, 29230 29232 35310, 35315, 35780, 35785, 35790 |
|  | Mol. wt. 504 | |
| 1-Naphthol-4-sulfonic acid | $C_{10}H_8O_4S$ | 10025 14670, 14675, 14680, 14685, 14690, 14695, 14700, 14705, 14710, 14715, 14720, 14725, 14730, 14740, 14745, 14750, 14755, 14760, 14765, 14770, 14780, 14785 21535, 21550, 22145, 22270, 22440, 22445, 22450, 22455, 23095, 23280, 23350, 23520, 23680, 23685, 23690, 23695, 23700, 23705, 23710, 23715, 23905, 24020, 24025, 24050, 24105, 24140, 24145, 24150, 24155, 24160, 24165, 24170, 24175, 24180, 24185, 24190, 24195, 24785, 25015, 25020, 26660, 26665, 26670, 26680, 26690, 26695, 26700, 26705, 26715, 26720, 26725, 26730, 26735 30230, 31625, 31630, 31635, 31675, 31760, 31800, 31865, 31900, 31905, 31950, 31951, 32050, 32055, 34085 35900 |
|  | Mol. wt. 224 m.p. 170° (decomp.) | |
| 1-Naphthol-4-sulfonic acid, 2-amino- | $C_{10}H_9NO_4S$ | 51410 |
|  | Mol. wt. 239 | |

1-Naphthol-4-sulfonic acid, 2-nitroso-

 $C_{10}H_7NO_5S$

56065

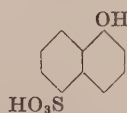


Mol. wt. 253

1-Naphthol-5-sulfonic acid

 $C_{10}H_8O_4S$

14800, 14805, 14810, 14815, 14820, 14825, 14830, 14835, 14840, 14850, 14855, 14860, 14862, 14865, 14870, 14875



Mol. wt. 224

21640, 22750, 22780, 23685, 23720, 24200, 24205, 24760, 26750, 26751

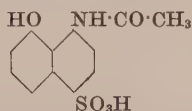
31640, 31765

m.p. 120°

1-Naphthol-5-sulfonic acid, 8-acetamido-

 $C_{12}H_{11}NO_5S$

17940, 17941, 17945



Mol. wt. 281

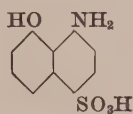
28430

31985

1-Naphthol-5-sulfonic acid, 8-amino-

 $C_{10}H_9NO_4S$

13385, 17120, 17125, 17130, 17135



Mol. wt. 239

20340, 20345, 20350, 20355, 22475, 22505, 22595, 22755, 23620, 23715, 23740, 23770, 23795, 23810, 23825, 23830, 23835, 24180, 24225, 24310, 24375, 24380, 24385, 24390, 24395, 27770

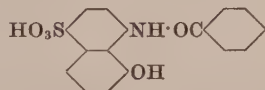
30015, 30210, 30215, 30220, 30380, 30385, 30390

35860, 35865

1-Naphthol-5-sulfonic acid, 8-benzamido-

 $C_{17}H_{13}NO_5S$

22815, 27770

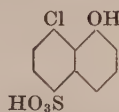


Mol. wt. 345

1-Naphthol-5-sulfonic acid, 8-chloro-

 $C_{10}H_7ClO_4S$

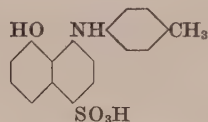
24260



Mol. wt. 258.5

1-Naphthol-5-sulfonic acid, 8-*p*-toluidino- $C_{17}H_{15}NO_4S$

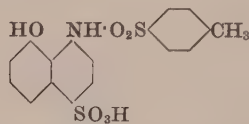
17650



Mol. wt. 361

1-Naphthol-5-sulfonic acid, 8-*p*-tolylsulfonamido- $C_{17}H_{15}NO_6S_2$

17950

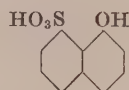


Mol. wt. 393

1-Naphthol-8-sulfonic acid

 $C_{10}H_8O_4S$

14880, 14885



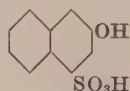
Mol. wt. 224

m.p. 107°

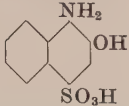
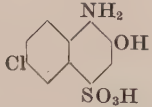
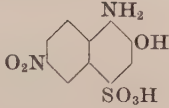

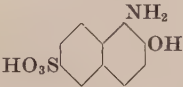
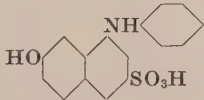




2-Naphthol-4-sulfonic acid

 $C_{10}H_8O_4S$

15950, 15951, 15955, 26995

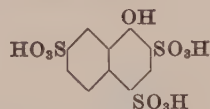


Mol. wt. 224

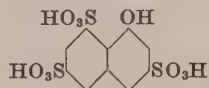
| | | |
|---|---------------------------|--|
| 2-Naphthol-4-sulfonic acid, 1-amino- | $C_{10}H_9NO_4S$ | 14305, 14640, 14641, 14880, 15050, 15705, 15706, 15707, 15708, 18760, 18761, 18762, 18810 29232 |
|  | Mol. wt. 239 | |
| 2-Naphthol-4-sulfonic acid, 1-amino-6-chloro- | $C_{10}H_8ClNO_4S$ | 18765 |
|  | Mol. wt. 273.5 | |
| 2-Naphthol-4-sulfonic acid, 1-amino-6-nitro- | $C_{10}H_8N_2O_6S$ | 14645, 14646, 14885, 15710, 15711, 15715, 15900, 17916, 18770 20265, 29130, 29290 |
|  | Mol. wt. 284 | |
| 2-Naphthol-6-sulfonic acid | $C_{10}H_8O_4S$ | 10020 15970, 15975, 15980, 15985, 15990, 15995, 16000, 16010, 16011, 16015, 16020, 16030, 16040, 16045, 16046, 16047, 16055, 16060, 16065, 16070, 16080, 16081, 16085, 16152 21630, 21640, 21725, 22490, 22495, 23290, 24300, 24765, 25110, 25410, 27000, 27001, 27010, 27015, 27020, 27025, 27050, 27060, 27065, 27070, 27075, 27080, 27085, 27090, 27095, 27110, 27115, 27130, 27201 30200, 34090, 34095 35870 50430, |
|  | Mol. wt. 224 m.p. 125° | |
| 2-Naphthol-6-sulfonic acid, 1-amino- | $C_{10}H_9NO_4S$ | 51405 |
|  | Mol. wt. 239 | |
| 2-Naphthol-6-sulfonic acid, 8-anilino- | $C_{16}H_{13}NO_4S$ | 17670 |
|  | Mol. wt. 315 | |
| 2-Naphthol-7-sulfonic acid | $C_{10}H_8O_4S$ | 21630, 27140 31680 <i>See also note under C.I. Pigment Red 1 (C.I.12070)</i> |
|  | Mol. wt. 224 m.p. 89° | |
| 2-Naphthol-7-sulfonic acid, 3-amino- | $C_{10}H_9NO_4S$ | 15720, 17105, 17135, 17240 22325 |
|  | Mol. wt. 239 | |
| 2-Naphthol-8-sulfonic acid | $C_{10}H_8O_4S$ | 10320 16046, 16047, 16050 22150, 22470, 22500, 22505, 23105, 23770, 24310, 27001, 27015, 27150, 27155, 27160, 27165, 27180 |
|  | Mol. wt. 224 | |
| 2-Naphthol-8-sulfonic acid, 1-amino- | $C_{10}H_9NO_4S$ | 17110 |
|  | Mol. wt. 239 | |

1-Naphthol-2,4,7-trisulfonic acid $C_{10}H_8O_{10}S_3$

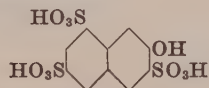
10316



Mol. wt. 384

1-Naphthol-3,6,8-trisulfonic acid $C_{10}H_8O_{10}S_3$ 22480, 23750, 24250
57030

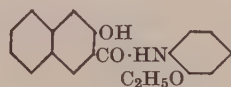
Mol. wt. 384

2-Naphthol-3,6,8-trisulfonic acid $C_{10}H_8O_{10}S_3$ 16290, 16295
27305, 27306, 27310, 27311

Mol. wt. 384

2-Naphtho-o-phenetidine, 3-hydroxy- $C_{19}H_{17}NO_2$

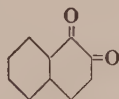
12470



Mol. wt. 307

 β -Naphthoquinaldine*See* Benzo[*f*]quinoline, 3-methyl-**1,2-Naphthoquinone** $C_{10}H_6O_2$

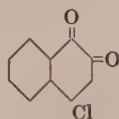
52060



Mol. wt. 158

m.p. decomposes
at 115–120°**1,2-Naphthoquinone, 4-chloro-** $C_{10}H_5ClO_2$

73800

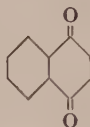


Mol. wt. 192.5

m.p. 188°

1,4-Naphthoquinone $C_{10}H_6O_2$

56075

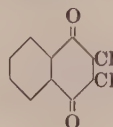


Mol. wt. 158

m.p. 125°

1,4-Naphthoquinone, 2,3-dichloro- $C_{10}H_4Cl_2O_2$

56080



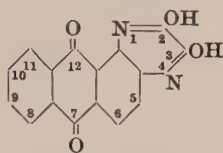
Mol. wt. 227

m.p. 193°

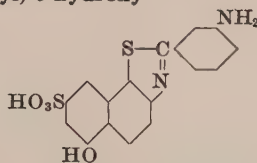
1,4-Naphthoquinone imine, 8-amino-5-hydroxy-*See* 1(4*H*)-Naphthalenone, 8-amino-5-hydroxy-4-imino-

1,2-Naphthoquinone-4-sulfonic acid*See* 1-Naphthalenesulfonic acid, 3,4-dihydro-3,4-dioxo-**1,2-Naphthoquinone-6-sulfonic acid***See* 2-Naphthalenesulfonic acid, 5,6-dihydro-5,6-dioxo-**Naphtho[2,3-*f*]quinoxaline-7,12-dione,
2,3-dihydroxy-** $C_{16}H_8N_2O_4$

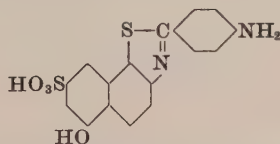
68300



Mol. wt. 292

**Naphtho[2,1]thiazole-8-sulfonic acid,
2-(*m*-aminophenyl)-6-hydroxy-** $C_{17}H_{12}N_2O_4S_2$ 19560, 19565, 19570, 19575, 19580
26735

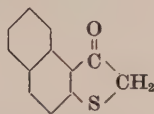
Mol. wt. 372

**Naphtho[2,1]thiazole-8-sulfonic acid,
2-(*p*-aminophenyl)-6-hydroxy-** $C_{17}H_{12}N_2O_4S_2$ 19590
28720, 28725

Mol. wt. 372

Naphtho[2,1-*b*]thiophen-1(2*H*)-one $C_{12}H_8OS$

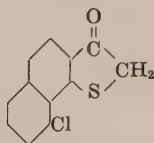
73410, 73665, 73680



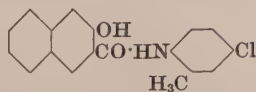
Mol. wt. 200

Naphtho[1,2-*b*]thiophen-3(2*H*)-one, 9-chloro- $C_{12}H_7ClOS$

73660, 73670



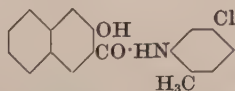
Mol. wt. 234.5

2-Naphtho-*o*-toluidide, 4'-chloro-3-hydroxy- $C_{18}H_{14}ClNO_2$ 12420
37525

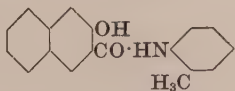
Mol. wt. 311.5

2-Naphtho-*o*-toluidide, 5'-chloro-3-hydroxy- $C_{18}H_{14}ClNO_2$

12430, 12431



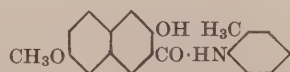
Mol. wt. 311.5

2-Naphtho-*o*-toluidide, 3-hydroxy- $C_{18}H_{16}NO_2$ 12370, 12380, 12385, 12390, 12395, 12400, 12405, 15900
37520

Mol. wt. 277

2-Naphtho-*o*-toluidide, 3-hydroxy-7-methoxy-C₁₉H₁₇NO₃

37568



Mol. wt. 307

2-Naphtho-*p*-toluidide, 3-hydroxy-C₁₈H₁₅NO₂

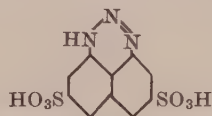
12440, 12445



Mol. wt. 277

1*H*-Naphtho[1,8]triazine-5,8-disulfonic acidC₁₀H₇N₃O₆S₂

19520

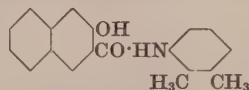


Mol. wt. 329

2-Naphtho-2,3-xylidide, 3-hydroxy-

C₁₉H₁₇NO₂

12450, 12455



Mol. wt. 291

1-Naphthylamine

C₁₀H₉N

11285, 11330, 11350, 11360, 11365, 11810, 12020, 12170, 13000, 13350, 14830, 14910, 14970, 15020, 16040, 16180, 16250, 16640, 17120, 18005

20080, 20090, 20091, 20115, 20350, 20355, 20370, 20395, 20420, 20440, 20510, 21535, 21690, 22110, 23400, 24090, 24860, 24885, 26000, 26020, 26030, 26040, 26080, 26150, 26230, 26260, 26270, 26300, 26305, 26310, 26315, 26320, 26330, 26340, 26360, 26361, 26365, 26370, 26400, 26405, 26500, 26690, 26695, 26700, 26750, 26751, 26945, 26950, 26955, 26995, 27060, 27065, 27070, 27075, 27080, 27085, 27090, 27095, 27220, 27225, 27230, 27235, 27240, 27245, 27250, 27255, 27260, 27510, 27515, 27520, 27640, 27645, 27710, 27715, 27720, 27725, 27790, 27940, 27945, 27950

30175, 30305, 30325, 31760, 31793, 31815, 31820, 31835, 31850, 31865, 31870, 31905, 31910, 31920, 31955, 32050, 33505, 33540, 34000, 34005, 34010, 34020, 34025, 34120, 34125, 34130, 34135, 34138, 34139, 34140, 34155, 34179, 34200, 34210, 34215, 34230

35510, 35860, 35865, 35870, 36010

37265, 37560, 37608

50080, 50095, 50370, 50375, 51180

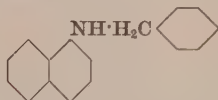
62570

Mol. wt. 143

m.p. 51°

1-Naphthylamine, *N*-benzyl-C₁₇H₁₅N

51185



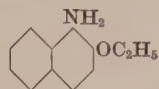
Mol. wt. 233

m.p. 66–67°

1-Naphthylamine-3,6-disulfonic acid, 8-amino-

See 2,7-Naphthalenedisulfonic acid, 4,5-diamino-

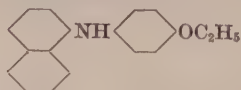
1-Naphthylamine, 2-ethoxy-

C₁₂H₁₃NO26980, 27540, 28455
34055, 34060

Mol. wt. 187

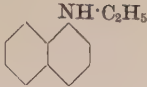
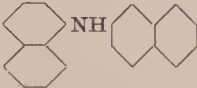


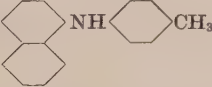




1-Naphthylamine, *N*-(*p*-ethoxyphenyl)-C₁₈H₁₇NO

44065, 44070, 44075



Mol. wt. 263

m.p. 80°

| | | | |
|---|---|--|---|
| 1-Naphthylamine, <i>N</i> -ethyl- |  | $C_{12}H_{13}N$ Mol. wt. 171 m.p. 59.5° | 13375 26040, 26330 42595, 44040 |
| 1-Naphthylamine, <i>N</i> -2-naphthyl- |  | $C_{20}H_{15}N$ Mol. wt. 269 | 44095 |
| 1-Naphthylamine, <i>N</i> -phenyl- |  | $C_{16}H_{13}N$ Mol. wt. 219 m.p. 62° b.p. 335°/258 mm. | 26340 42563, 44000, 44045, 44050 |
| 1-Naphthylamine, 4-phenylazo- |  | $C_{16}H_{13}N_3$ Mol. wt. 247 m.p. 120° | 50370 |
| 1-Naphthylamine, <i>N</i> - <i>p</i> -tolyl- |  | $C_{17}H_{15}N$ Mol. wt. 233 m.p. 78.5-79° | 44060 |
| 2-Naphthylamine |  | $C_{10}H_9N$ Mol. wt. 143 m.p. 112° | 11380, 11385, 11390, 11395, 12175, 13420, 14920, 15000 21515, 21660, 21700, 23550, 24865, 29255, 29260 37270, 37565 40645 42700 56045 68000 |
| Note: β- or 2-Naphthylamine is not now usually used as such because of its carcinogenic properties. Frequently 2-amino-1-naphthalene-sulfonic acid is used in its place, the sulfonic acid group being readily removed in the course of reaction. | | | |
| 2-Naphthylamine, <i>N</i> -ethyl- |  | $C_{12}H_{13}N$ Mol. wt. 171 b.p. 305° | 13460 25730, 26050 |
| 2-Naphthylamine, <i>N</i> -ethyl- <i>N</i> -phenyl- |  | $C_{18}H_{17}N$ Mol. wt. 247 m.p. 58° | 44055 |
| 2-Naphthylamine, <i>N</i> -methyl- |  | $C_{11}H_{11}N$ Mol. wt. 157 b.p. 308-310° | 13455 |

2-Naphthylamine, *N*-methyl-*N*-phenyl- $C_{17}H_{15}N$

44055



Mol. wt. 233

m.p. 52–53°

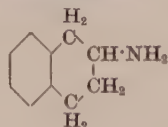
2-Naphthylamine, *N*-phenyl- $C_{16}H_{13}N$ 22750, 22755, 25735
50150, 50305, 50306, 50335

Mol. wt. 219

m.p. 108°

2-Naphthylamine, 1,2,3,4-tetrahydro- $C_{10}H_{13}N$

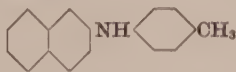
61560



Mol. wt. 147

dl-form,
b.p. 249°/710 mm.
(decomp.)**2-Naphthylamine, *N*-*p*-tolyl-** $C_{17}H_{15}N$

26435

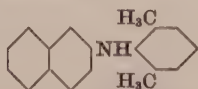


Mol. wt. 233

m.p. 102–103°

2-Naphthylamine, *N*-2,6-xylyl- $C_{18}H_{17}N$

50300, 50310



Mol. wt. 247

Nevile and Winther's acid and salt*See* 1-Naphthol-4-sulfonic acid***m*-Nitraniline***See* Aniline, *m*-nitro-**4'-Nitrodiphenyl-4-carboxylic acid***See* 4-Biphenylcarboxylic acid, 4'-nitro-**O****Octadecylamine** $C_{18}H_{39}N$

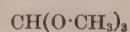
68410



Mol. wt. 269





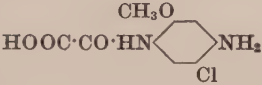
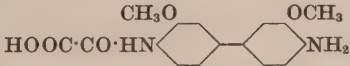
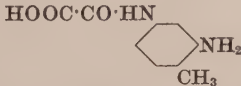
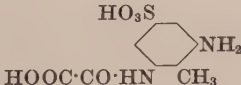
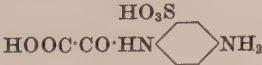
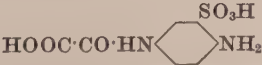
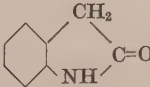
Orthanilic acid*See* Benzenesulfonic acid, *o*-amino-**Orthoformic acid, trimethyl ester** $C_4H_{10}O_3$

48070



Mol. wt. 106

b.p. 102°

| | | |
|---|-------------------------------|--|
| Oxalic acid | $C_2H_2O_4$ | 42785, 43800, 46000 53060 68300 |
|  | Mol. wt. 90 (anhydrous) | m.p. 98° (hydrated) and 189.5° (anhydrous) |
| Oxalyl chloride | $C_2Cl_2O_2$ | 65405 |
|  | Mol. wt. 127 | m.p. -12° b.p. 63.5-64°/763 mm. |
| Oxanilic acid, m-amino- | $C_8H_8N_2O_3$ | 22090, 22095, 23350, 24050, 26240 31525, 31800, 31805, 31830, 31900, 31915, 31935, 31950, 31960, 31965, 31970 |
|  | Mol. wt. 180 | |
| Oxanilic acid, p-amino- | $C_8H_8N_2O_3$ | 11275 21530 30220, 34050, 34085, 34090, 34095, 34175, 34290 |
|  | Mol. wt. 180 | |
| Oxanilic acid, 4'-amino-5'-chloro-2'-methoxy- | $C_9H_5ClN_2O_4$ | 21640, 26650, 27115 31680, 34080 |
|  | Mol. wt. 244 | |
| Oxanilic acid, 4'-(4-amino-3-methoxyphenyl)-2'-methoxy- | $C_{16}H_{16}N_2O_5$ | 17500 |
|  | Mol. wt. 316 | |
| Oxanilic acid, 3'-amino-4'-methyl- | $C_9H_{10}N_2O_3$ | 22100 31895 35900 |
|  | Mol. wt. 194 | |
| Oxanilic acid, 3'-amino-2'-methyl-5'-sulfo- | $C_9H_{10}N_2O_6S$ | 29085 |
|  | Mol. wt. 274 | |
| Oxanilic acid, 4'-amino-2'-sulfo- | $C_8H_8N_2O_6S$ | 21610, 27640 34055, 34060 |
|  | Mol. wt. 260 | |
| Oxanilic acid, 4'-amino-3'-sulfo- | $C_8H_8N_2O_6S$ | 35300 |
|  | Mol. wt. 260 | |
| Oxindole | C_8H_7NO | 73200, 73635 |
|  | Mol. wt. 133 m.p. 126° | |

P

| | | |
|--|-------------------|-------|
| Palmitic acid | $C_{16}H_{32}O_2$ | 74380 |
| $CH_3 \cdot (CH_2)_{13} \cdot CH_2 \cdot COOH$ | | |
| | Mol. wt. 256 | |

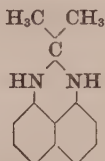
| | | |
|--|--------------|--------------|
| 2,4-Pentanedione | | 11640, 11650 |
| $CH_3 \cdot CO \cdot CH_2 \cdot CO \cdot CH_3$ | | |
| | Mol. wt. 100 | |

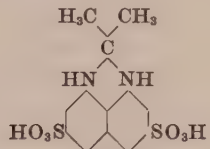
Pentylamine
See Amylamine


Peri acid
See 1-Naphthalenesulfonic acid, 8-amino-


Peri acid, N-phenyl-
See 1-Naphthalenesulfonic acid, 8-anilino-


Peri acid, N-p-tolyl-
See 1-Naphthalenesulfonic acid, 8-p-toluidino-

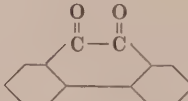
| | | |
|---|-------------------|-------|
| Perimidine, 2,3-dihydro-2,2-dimethyl- | $C_{13}H_{14}N_2$ | 26150 |
|  | Mol. wt. 198 | |

| | | |
|---|-------------------------|----------------|
| 5,8-Perimidinedisulfonic acid, 2,3-dihydro-2,2-dimethyl- | $C_{13}H_{14}N_2O_6S_2$ | 19520 20540 |
|  | Mol. wt. 326 | |

| | | |
|---|-------------------|-------|
| 3,9-Perylenedicarboxylic acid | $C_{22}H_{12}O_4$ | 59075 |
|  | Mol. wt. 340 | |
| | Sinters ca. 360° | |

| | | |
|---|-------------------|-----------------------|
| 3,4,9,10-Perylenetetracarboxylic acid | $C_{24}H_{12}O_8$ | 71135 71140, 71145 |
|  | Mol. wt. 428 | |

| | | |
|---|----------------------|-------|
| 3,4,9,10-Perylenetetracarboxylic diimide | $C_{24}H_{10}N_2O_4$ | 71130 |
|  | Mol. wt. 390 | |

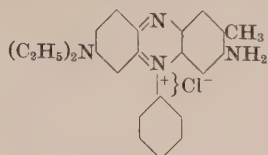
| | | |
|---|----------------|-------|
| Phenanthrenequinone | $C_{14}H_8O_2$ | 50000 |
|  | Mol. wt. 208 | |
| | m.p. 206° | |

**Phenazinium chloride,
3-amino-7-diethylamino-2-methyl-5-phenyl-**

$C_{23}H_{25}ClN_4$

11975, 12211
See also 50216

Mol. wt. 392

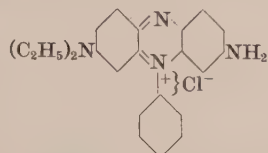


**Phenazinium chloride,
3-amino-7-diethylamino-5-phenyl-**

$C_{22}H_{23}ClN_4$

11050, 11090, 11000, 11825
See also 50206

Mol. wt. 378

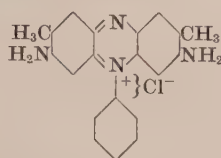


**Phenazinium chloride,
3,7-diamino-2,8-dimethyl-5-phenyl-**

$C_{20}H_{19}ClN_4$

12210
See also 50240

Mol. wt. 350

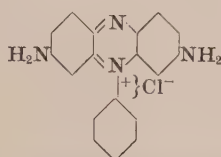


**Phenazinium chloride,
3,7-diamino-5-phenyl-**

$C_{18}H_{15}ClN_4$

11045
See also 50200

Mol. wt. 332

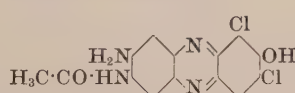


**2-Phenazinol,
7-acetamido-8-amino-1,3-dichloro-**

$C_{14}H_{10}Cl_2N_4O_2$

53740

Mol. wt. 337

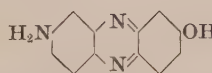


2-Phenazinol, 8-amino-

$C_{12}H_9N_3O$

53710, 53711

Mol. wt. 211

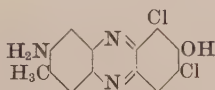


2-Phenazinol, 8-amino-1,3-dichloro-7-methyl-

$C_{13}H_9Cl_2N_3O$

53730

Mol. wt. 294

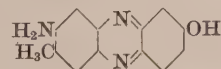


2-Phenazinol, 8-amino-7-methyl-

$C_{13}H_{11}N_3O$

53720, 53721, 53722, 53723, 53724, 53725

Mol. wt. 225

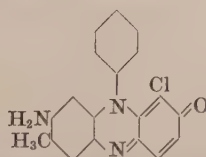


**2(10H)-Phenazinone,
8-amino-1-chloro-7-methyl-10-phenyl-**

$C_{19}H_{14}ClN_3O$

53780

Mol. wt. 335.5

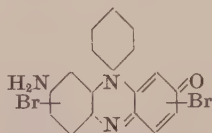


2(10H)-Phenazinone, 8-aminodibromo-10-phenyl-

$C_{18}H_{11}Br_2N_3O$

53770

Mol. wt. 445

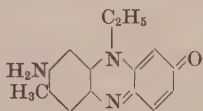


2(10H)-Phenazinone, 8-amino-10-ethyl-7-methyl-

$C_{15}H_{15}N_3O$

53700

Mol. wt. 239

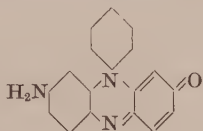


2(10H)-Phenazinone, 8-amino-10-phenyl-

$C_{18}H_{13}N_3O$

53760

Mol. wt. 287



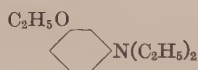
***m*-Phenetidine, *N,N*-diethyl-**

$C_{12}H_{19}NO$

51005

Mol. wt. 193

m.p. 78°
b.p. 276–280°



***m*-Phenetidine, *N-p*-tolyl-**

$C_{16}H_{17}NO$

43525

Mol. wt. 227

m.p. 30°
b.p. 343–351°/96 mm.



***o*-Phenetidine**

$C_8H_{11}NO$

37588

Mol. wt. 137

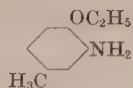


***o*-Phenetidine, 5-methyl-**

$C_9H_{13}NO$

37260

Mol. wt. 151



***p*-Phenetidine**

$C_8H_{11}NO$

11870, 12010, 14080


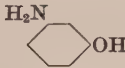
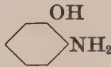



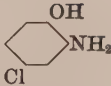
Mol. wt. 137

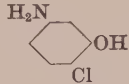
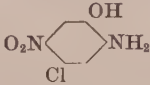
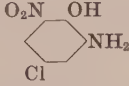
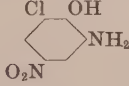
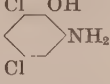
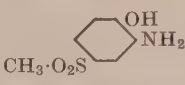

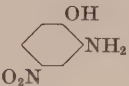
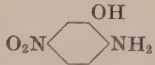
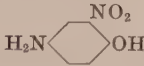
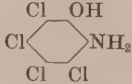
m.p. 2.4°
b.p. 254°

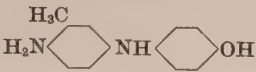
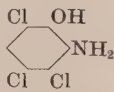
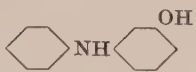


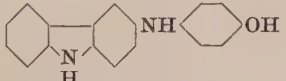

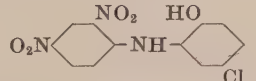
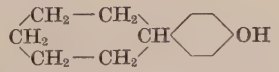
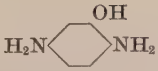
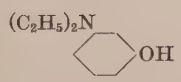


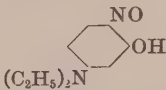
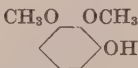
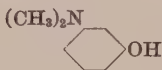
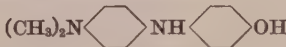
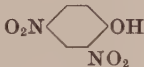
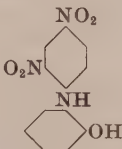
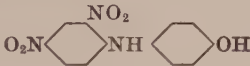
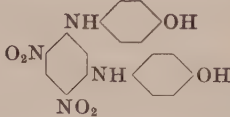
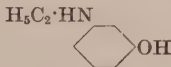
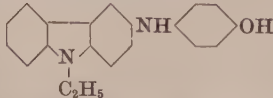
37599


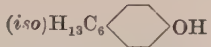
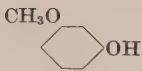

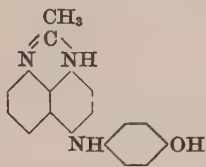
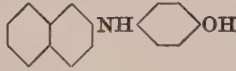


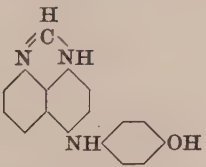
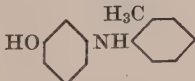
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71145


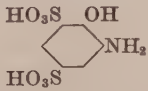
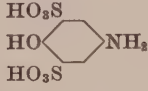
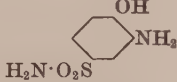
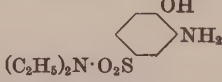
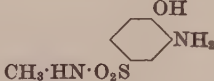
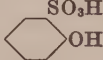
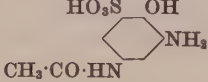
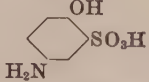
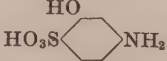
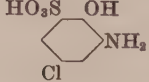
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| Phenol |  | C_6H_6O | 10305 11800, 11810, 11820, 11825, 18157 21280, 21710, 22100, 22190, 22195, 22230, 22238, 22240, 22245, 22870, 23080, 23260, 23265, 23266, 23270, 23360, 23605, 23620, 23625, 23630, 23635, 23905, 24010, 24125, 24130, 24780, 24890, 24895, 25030, 25135, 26070, 26075, 26080, 26500, 26510 30225, 30280, 30285, 30290, 30295, 30300, 30305, 31650, 31735, 31860, 31980, 31985, 34035 35520, 35700, 36300 43800 50370, 57025 53290, 53291 58225 62020, 62025, 62026 |
| Phenol, <i>p</i>-acetamido- | <i>See</i> Acetanilide, <i>p</i> -hydroxy- | | |
| Phenol, 4-acetamido-2-amino-6-nitro- | <i>See</i> Acetanilide, 3'-amino-4'-hydroxy-5'-nitro- | | |
| Phenol, 2-acetamido-6-amino-4-nitro- | <i>See</i> Acetanilide, 3'-amino-2'-hydroxy-5'-nitro- | | |
| Phenol, <i>m</i>-amino- |  | C_6H_7NO | 11970 76545 Mol. wt. 109 m.p. 122-123° |
| Phenol, <i>o</i>-amino- |  | C_6H_7NO | 16670 53130 76520 Mol. wt. 109 m.p. 172° |
| Phenol, <i>p</i>-amino- |  | C_6H_7NO | 10345, 11965, 16555, 18850, 18950 40025, 40030 53005, 53006, 53135, 53165, 53166, 53167, 53180, 53190, 53590 62580, 68225 76550 Mol. wt. 109 m.p. 186° |
| Phenol, <i>p</i>-(<i>p</i>-aminoanilino)- |  | $C_{12}H_{12}N_2O$ | 76560 Mol. wt. 200 m.p. 166° |
| Phenol, <i>p</i>-(<i>p</i>-aminobenzylideneamino)- |  | $C_{13}H_{12}N_2O$ | 53225 Mol. wt. 212 |
| Phenol, 2-amino-4-chloro- |  | C_6H_6ClNO | 13710, 14745, 14850, 14980, 15045, 16680, 16710, 16711, 17220, 18090 20265, 20325 76525 Mol. wt. 143 m.p. 138° |

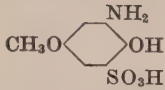
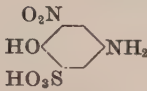
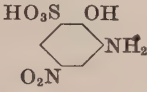
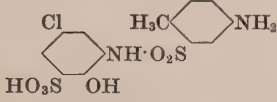

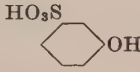
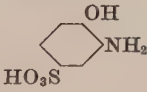
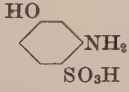
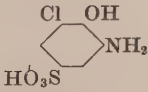
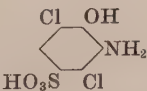
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|--------------------------------------|---|--------------------|--|
| Phenol, 5-amino-2-chloro- |  | C_6H_6ClNO | 30335 |
| | | Mol. wt. 143 | |
| Phenol, 2-amino-4-chloro-5-nitro- |  | $C_6H_5ClN_2O_3$ | 14770, 15025, 16685 |
| | | Mol. wt. 188 | |
| Phenol, 2-amino-4-chloro-6-nitro- |  | $C_6H_5ClN_2O_3$ | 14865, 17525 |
| | | Mol. wt. 188 | |
| Phenol, 2-amino-6-chloro-4-nitro- |  | $C_6H_5ClN_2O_3$ | 11640, 12695, 13305, 14870, 17005, 19515 20125 |
| | | Mol. wt. 188 | |
| Phenol, 2-amino-4,6-dichloro- |  | $C_6H_5Cl_2NO$ | 12190 18170 |
| | | Mol. wt. 178 | |
| Phenol, 2-amino-4-(methylsulfonyl)- |  | $C_7H_9NO_3S$ | 12205 |
| | | Mol. wt. 187 | |
| Phenol, p-(4-amino-1-naphthylamino)- |  | $C_{16}H_{14}N_2O$ | 53530 |
| | | Mol. wt. 250 | |
| Phenol, 2-amino-4-nitro- |  | $C_6H_6N_2O_3$ | 11700, 11940, 12197, 12714, 12716, 13250, 13310, 14765, 14860, 16060, 16200, 16730, 17225, 17255, 17520, 17670, 18092, 18840, 18875, 19510 |
| | | Mol. wt. 154 | 20018, 20110, 20111, 20120, 20320, 26210 |
| | | m.p. 142° | 33520 76530 |
| Phenol, 2-amino-5-nitro- |  | $C_6H_6N_2O_3$ | 11225, 12195, 12196, 12715, 12716, 13425, 17010, 17230, 18880, 18885, 19050 |
| | | Mol. wt. 154 | 28685, 76535 |
| | | m.p. 201–202° | |
| Phenol, 4-amino-2-nitro- |  | $C_6H_6N_2O_3$ | 76555 |
| | | Mol. wt. 154 | |
| | | m.p. 131° | |
| Phenol, 2-amino-3,4,5,6-tetrachloro- |  | $C_6H_3Cl_4NO$ | 17945 |
| | | Mol. wt. 247 | |

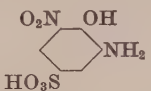
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|---|---|--|
| Phenol, <i>p</i>-(4-amino-<i>m</i>-toluidino)- | $C_{13}H_{14}N_2O$ | 53440, 53441 76565 |
|  | Mol. wt. 214 | |
| | m.p. 160° | |
| Phenol, 2-amino-3,4,6-trichloro- | $C_6H_4Cl_3NO$ | 14760, 17250, 17650, 17940, 17941, 17950 |
|  | Mol. wt. 212 | |
| Phenol, <i>m</i>-anilino- | $C_{12}H_{11}NO$ | 23675, 25060 51215 |
|  | Mol. wt. 185 | |
| | m.p. 81.5-82° | |
| Phenol, <i>p</i>-anilino- | $C_{12}H_{11}NO$ | 53228 |
|  | Mol. wt. 185 | |
| Phenol, <i>p</i>-<i>tert</i>-butyl- | $C_{10}H_{14}O$ | 14250, 14251 |
|  | Mol. wt. 150 | |
| Phenol, <i>p</i>-(3-carbazolylamino)- | $C_{18}H_{14}N_2O$ | 53300, 53301, 53630, 53631 |
|  | Mol. wt. 274 | |
| Phenol, <i>p</i>-chloro- | C_6H_5ClO | 11830 58050 |
|  | Mol. wt. 118 | |
| Phenol, 4-chloro-2-(2,4-dinitroanilino)- | $C_{12}H_8ClN_3O_5$ | 53260 |
|  | Mol. wt. 309.5 | |
| Phenol, <i>p</i>-cyclohexyl- | $C_{12}H_{18}O$ | 21230 |
|  | Mol. wt. 176 | |
| Phenol, 2,5-diamino- | $C_6H_8N_2O$ | For derived azo dyes see Phenol, 2-amino-5-nitro- |
|  | Mol. wt. 148 | |
| Phenol, <i>m</i>-diethylamino- | $C_{10}H_{15}NO$ | 45010, 45020, 45050, 45070, 45095, 45100, 45166, 45170, 45180, 45215, 45305, 51004, 51005 |
|  | Mol. wt. 165 | |
| | m.p. 78° b.p. 276-280° or 201°/25 mm. | |

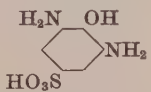
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|---|------------------------------|---|
| Phenol, 5-diethylamino-2-nitroso- | $C_{10}H_{14}N_2O_2$ | 51180, 51185 |
|  | Mol. wt. 194 | |
| | m.p. 84° | |
| Phenol, 2,3-dimethoxy- | $C_8H_{10}O_3$ | 43875 |
|  | Mol. wt. 154 | |
| Phenol, <i>m</i> -dimethylamino- | $C_8H_{11}NO$ | 45005, 45050, 45090, 45165, 45210, 45300, 45310, 45315 51000 |
|  | Mol. wt. 137 | |
| | m.p. 87° b.p. 265–268° | |
| Phenol, <i>p</i> -(<i>p</i> -dimethylaminoanilino)- | $C_{14}H_{18}N_2O$ | 53430 |
|  | Mol. wt. 228 | |
| Phenol, 2,4-dinitro- | $C_6H_4N_2O_6$ | 53185, 53186, 53190, 53195, 53196, 53200 |
|  | Mol. wt. 184 | |
| | m.p. 113° | |
| Phenol, <i>o</i> -(2,4-dinitroanilino)- | $C_{12}H_9N_3O_5$ | 53245, 53246, 53247, 53248 |
|  | Mol. wt. 275 | |
| | m.p. 205° | |
| Phenol, <i>p</i> -(2,4-dinitroanilino)- | $C_{12}H_9N_3O_5$ | 53200, 53230, 53235, 53236, 53245, 53246, 53247, 53248 |
|  | Mol. wt. 275 | |
| | m.p. 195–196° | |
| Phenol, 4,4'-(4,6-dinitro- <i>m</i> -phenylenediimino)di- | $C_{18}H_{14}N_4O_6$ | 53265 |
|  | Mol. wt. 382 | |
| Phenol, <i>m</i> -ethylamino- | $C_8H_{11}NO$ | 45165, 45166 |
|  | Mol. wt. 137 | |
| | m.p. 62° b.p. 176°/12 mm. | |
| Phenol, <i>p</i> -(9-ethyl-3-carbazolylamino)- | $C_{20}H_{18}N_2O$ | 53640 |
|  | Mol. wt. 302 | |

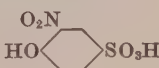
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|---|-----------------------|---|
| Phenol, 4,4'-iminodi- | $C_{12}H_{11}NO$ | 53290, 53291 |
|  | Mol. wt. 185 | |
| Phenol, <i>p</i>-isohexyl- | $C_{12}H_{18}O$ | 21050, 21270 |
|  | Mol. wt. 178 | |
| Phenol, <i>m</i>-methoxy- | $C_7H_8O_2$ | 45310 |
|  | Mol. wt. 124 | |
| | Liquid, b.p. 243-244° | |
| Phenol, 4,4'-methylenedi- | $C_{13}H_{12}O_2$ | 35220, 35225, 35230 |
|  | Mol. wt. 200 | |
| Phenol, <i>p</i>-(2-methyl-6(or 7)-perimidylamino)- | $C_{18}H_{18}N_3O$ | 53560 |
|  | Mol. wt. 289 | |
| Phenol, <i>p</i>-(2-naphthylamino)- | $C_{16}H_{13}NO$ | 53290, 53291, 53295, 53300, 53301 |
|  | Mol. wt. 235 | |
| Phenol, <i>p</i>-nitro- | $C_6H_5NO_2$ | 53165, 53166, 53167, 53170, 53175, 53190, 53295, 53300, 53301 |
|  | Mol. wt. 139 | |
| | m.p. 114° | |
| Phenol, <i>p</i>-nitroso- | $C_6H_5NO_2$ | 53165, 53166, 53167, 53190, 53442 |
|  | Mol. wt. 123 | Intermediate for the preparation of Carbazole Indophenol and Ethyl Carbazole Indophenyl , both of which compounds are intermediates for thionated vat dyes and for sulfide dyes |
| | m.p. 126° | |
| Phenol, <i>p</i>-(6(or 7)-perimidylamino)- | $C_{17}H_{13}N_3O$ | 53550 |
|  | Mol. wt. 275 | |
| Phenol, <i>m</i>-(<i>o</i>-toluidino)- | $C_{13}H_{13}NO$ | 30336 |
|  | Mol. wt. 199 | |

| | | |
|---|------------------------|---|
| Phenol, <i>p</i>-phenylazo- | $C_{11}H_{10}N_2O$ | 53220 |
|  | Mol. wt. 198 | |
| | m.p. 152° b.p. 220° | |
| 1-Phenol-2,4-disulfonic acid, 6-amino- | $C_6H_7NO_7S_2$ | 26955 |
|  | Mol. wt. 237 | |
| 1-Phenol-2,6-disulfonic acid, 4-amino- | $C_6H_7NO_7S_2$ | 14340 |
|  | Mol. wt. 237 | |
| 1-Phenol-4-sulfonamide, 2-amino- | $C_6H_8N_2O_3S$ | 15675, 17515, 18870 26545, 29120, 29230 30150 48050 |
|  | Mol. wt. 188 | |
| 1-Phenol-4-sulfonamide, 2-amino-<i>N,N</i>-diethyl- | $C_{10}H_{16}N_2O_3S$ | For derived azo dyes <i>see</i> Metanilamide, <i>N,N</i> -diethyl-4-methoxy- |
|  | Mol. wt. 244 | |
| 1-Phenol-4-sulfonamide, 2-amino-<i>N</i>-methyl- | $C_7H_{10}N_2O_3S$ | 18165 29125 |
|  | Mol. wt. 202 | |
| 1-Phenol-2-sulfonic acid | $C_6H_6O_4S$ | 22400 |
|  | Mol. wt. 174 | |
| 1-Phenol-2-sulfonic acid, 4-acetamido-6-amino- | $C_9H_{10}N_2O_6S$ | 15695 |
|  | Mol. wt. 246 | |
| 1-Phenol-2-sulfonic acid, 4-amino- | $C_6H_7NO_4S$ | 42525 |
|  | Mol. wt. 189 | |
| 1-Phenol-2-sulfonic acid, 5-amino- | $C_6H_7NO_4S$ | 30370 |
|  | Mol. wt. 189 | |
| 1-Phenol-2-sulfonic acid, 6-amino-4-chloro- | $C_6H_5ClNO_4S$ | 13890, 14750, 14855, 15680, 15681, 16505, 18160, 18800, 18920, 18940, 19240, 19350, 19351, 19360, 19600 48045 |
|  | Mol. wt. 223.5 | |

| | | |
|---|---------------------------|---|
| 1-Phenol-2-sulfonic acid, 6-amino-4-methoxy- | $C_7H_9NO_6S$ | 48045 |
|  | Mol. wt. 219 | |
| 1-Phenol-2-sulfonic acid, 4-amino-6-nitro- | $C_6H_6N_2O_6S$ | 26565 |
|  | Mol. wt. 234 | |
| 1-Phenol-2-sulfonic acid, 6-amino-4-nitro- | $C_6H_6N_2O_6S$ | 13280, 13900, 13901, 14250, 14251, 15685, 17560, 18180, 18735, 18736, 18745 |
|  | Mol. wt. 234 | 48045 |
| 1-Phenol-2-sulfonic acid, 6-(5-amino-o-tolylsulfonamido)-4-chloro- | $C_{13}H_{13}ClN_2O_6S_2$ | 19035 |
|  | Mol. wt. 392 | |
| 1-Phenol-2-sulfonic acid, 4-(p-dimethylaminoanilino)- | $C_{14}H_{16}N_2O_4S$ | 53420 |
|  | Mol. wt. 308 | |
| 1-Phenol-3-sulfonic acid | $C_6H_6O_4S$ | 22405 |
|  | Mol. wt. 174 | |
| 1-Phenol-4-sulfonic acid, 2-amino- | $C_6H_7NO_4S$ | 13225, 14290, 15670, 16500, 16675, 16705, 17510, 17912, 17965, 18157, 18730, 19345 |
|  | Mol. wt. 189 | 20115, 28670, 29167 30145 35800 <i>See also azo dyes derived from metanilic acid, 4-methoxy- and metanilic acid, 4-chloro-</i> |
| 1-Phenol-4-sulfonic acid, 3-amino- | $C_6H_7NO_4S$ | 14345 22260 |
|  | Mol. wt. 189 | |
| 1-Phenol-4-sulfonic acid, 2-amino-6-chloro- | $C_6H_6ClNO_4S$ | 19245 29115, 29270 |
|  | Mol. wt. 223 | |
| 1-Phenol-4-sulfonic acid, 2-amino-3,6-dichloro- | $C_6H_5Cl_2NO_4S$ | 14755 |
|  | Mol. wt. 258 | |

| | | |
|---|-----------------|--|
| 1-Phenol-4-sulfonic acid, 2-amino-6-nitro- | $C_6H_6N_2O_6S$ | 13230, 13340, 13420, 14235, 14300, 15690, 15691, 16510, 17260, 18740, 18845, 19355 |
|  | Mol. wt. 234 | 20325, 29128, 29130, 29275 33525 |

| | | |
|---|-----------------|--------------|
| 1-Phenol-4-sulfonic acid, 2,6-diamino- | $C_6H_8N_2O_4S$ | 21720, 21725 |
|  | Mol. wt. 204 | |

| | | |
|---|---------------|-------|
| 1-Phenol-4-sulfonic acid, 2-nitro- | $C_6H_6NO_6S$ | 10392 |
|  | Mol. wt. 219 | |

Phenosafranine

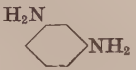
See Phenazinium chloride, 3,7-diamino-5-phenyl-

Phenosafranine, *N,N*-diethyl-

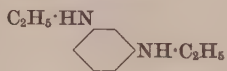
See Phenazinium chloride, 3-amino-7-diethylamino-5-phenyl-

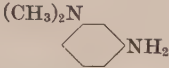




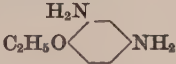


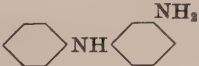
N,N'-*p*-Phenylenedisformamide

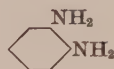
See Formamide, *N,N'*-*p*-phenylenedis-

| | | |
|---|--------------|--|
| <i>m</i>-Phenylenediamine | $C_6H_8N_2$ | 11270, 11275, 11280, 11285, 11290, 13220, 13225, 13230, 13235, 13240 |
|  | Mol. wt. 108 | 20000, 20070, 20075, 20080, 20090, 20091, 20095, 20100, 20110, 20115, 20120, 20125, 21000, 21030, 21500, 21530, 21680, 22030, 22035, 22040, 22045, 22046, 22050, 25050, 25080, 25260, 25370, 26000, 26220, 26230, 26240, 26245 |
| | m.p. 63–64° | 30000, 30005, 30025, 30030, 30035, 30040, 30045, 30050, 30055, 30060, 30065, 30070, 30075, 30080, 30085, 30090, 30170, 30180, 30235, 30365, 30375, 30395, 31500, 31505, 31510, 31515, 31520, 31535, 31546, 31555, 31560, 31605, 31625, 31645, 31660, 31665, 31670, 31685, 31700, 31705, 31710, 31805, 31810, 31860, 31885, 31960, 31995, 32000, 32010, 32015, 32045, 33500, 33505, 34000 |
| | | 35000, 35005, 35010, 35020, 35025, 35040, 35060, 35075, 35130, 35200, 35205, 35210, 35255, 35275, 35300, 35410, 35430, 35435, 35500, 35510, 35520, 35530, 35535, 35540, 35545, 35600, 35700, 35710, 35715, 35720, 35730, 35750, 36000, 36010, 36030, 36040, 36210, 36220, 36310, 36311, 36320 |
| | | For disazo dyes $E^1 \leftarrow D \rightarrow E^3$ derived from <i>m</i> -phenylenediamine <i>see</i> acetanilide, <i>m</i> -amino-; formanilide, <i>m</i> -amino- and oxanilic acid, <i>m</i> -amino- |
| | | 46000, 46075, 50030, 51010 |
| | | 53085 |
| | | 76025 |

| | | |
|---|---------------|--------------|
| <i>m</i>-Phenylenediamine, 4-chloro- | $C_6H_7ClN_2$ | 11300, 13280 |
|  | Mol. wt. 142 | 21505 |
| | m.p. 91° | 30240 |
| | | 35270 |
| | | 76027 |

| | | |
|---|-------------------|-------|
| <i>m</i>-Phenylenediamine, <i>N,N'</i>-diethyl- | $C_{10}H_{16}N_2$ | 50035 |
|  | Mol. wt. 164 | |
| | Liquid, b.p. 277° | |

| | | |
|---|-------------------|---|
| <i>m</i>-Phenylenediamine, <i>N,N</i>-dimethyl- | $C_8H_{12}N_2$ | 46020, 46055 |
|  | Mol. wt. 136 | |
| <i>m</i>-Phenylenediamine, <i>N,N'</i>-di-2-naphthyl- | $C_{26}H_{20}N_2$ | 50270 |
|  | Mol. wt. 360 | |
| | m.p. 191° | |
| <i>m</i>-Phenylenediamine, <i>N,N'</i>-diphenyl- | $C_{18}H_{16}N_2$ | 26270 50220, 50221 |
|  | Mol. wt. 260 | |
| | m.p. 95° | |
| <i>m</i>-Phenylenediamine, <i>N,N'</i>-di-<i>o</i>-tolyl- | $C_{20}H_{20}N_2$ | 50255 |
|  | Mol. wt. 288 | |
| <i>m</i>-Phenylenediamine, <i>N,N'</i>-di-<i>p</i>-tolyl- | $C_{20}H_{20}N_2$ | 50305 |
|  | Mol. wt. 288 | |
| | m.p. 137° | |
| <i>m</i>-Phenylenediamine, 4-ethoxy- | $C_8H_{12}N_2O$ | 76055 |
|  | Mol. wt. 152 | |
| | m.p. 67-68° | |
| <i>m</i>-Phenylenediamine, 4-methoxy- | $C_7H_{10}N_2O$ | 21030 30250 35265 76050 |
|  | Mol. wt. 138 | |
| | m.p. 67-68° | |
| <i>m</i>-Phenylenediamine, 4-nitro- | $C_6H_7N_3O_2$ | 11310, 13300 20250, 20280, 21510, 22060, 22070, 22920, 26280 34015, 34020, 34025, 34900 35850, 35860, 35865 76030 |
|  | Mol. wt. 153 | |
| | m.p. 161° | |
| <i>m</i>-Phenylenediamine, <i>N</i>-phenyl- | $C_{12}H_{12}N_2$ | 18058, 46045, 46075 |
|  | Mol. wt. 184 | |
| | m.p. 135° | |

o-Phenylenediamine $C_6H_8N_2$

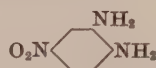
Mol. wt. 108

m.p. 102–103°
b.p. 256–258°42635
71100, 71105, 71110
76010**o-Phenylenediamine, 4-chloro-** $C_6H_7ClN_2$

Mol. wt. 142.5

m.p. 76°

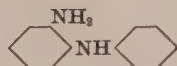
71115, 76015

o-Phenylenediamine, 4-nitro- $C_6H_7N_3O_2$

Mol. wt. 153

m.p. 198°

76020

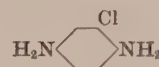
o-Phenylenediamine, N-phenyl- $C_{12}H_{12}N_2$

Mol. wt. 184

m.p. 79–80°

42715
50000, 50005**p-Phenylenediamine** $C_6H_8N_2$

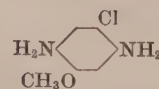
Mol. wt. 108

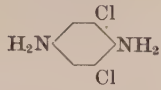






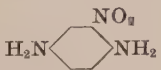
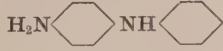
10375
11255, 11275, 13030, 14045, 14155, 16580, 18120
20000, 21530, 21535, 21540, 21545, 21550, 21555, 21570, 21571,
21575, 21580, 21590, 21600
30000, 30005, 30010, 30015, 30020, 30025, 31535, 31540, 31545,
31550, 31555, 31560, 31565, 31570, 31575, 31580, 31585,
31590, 31600, 31605, 31610, 31615, 31620, 31625, 31630,
31635, 31640, 31645, 31655, 31660
35200, 35255, 35256, 35260, 35265, 35270, 35275, 35290, 35295,
35315, 36000, 36020The above azo dyes are derived indirectly from *p*-phenylenediamine through acetanilide, *p*-amino-, formylanilide, *p*-amino- or oxanilic acid, *p*-amino- or through *p*-nitroaniline40065, 40066
49400, 50050, 50095, 50200, 50410, 50411
52000, 52005
53045, 53075, 53180
66500, 66505
76060**p-Phenylenediamine, N-(*p*-aminophenyl)-***See* Diphenylamine, 4,4'-diamino-**p-Phenylenediamine, 2-chloro-** $C_6H_7ClN_2$

Mol. wt. 142.5

m.p. 64°

76065

p-Phenylenediamine, 2-chloro-5-methoxy- $C_7H_9ClN_2O$ For disazo dyes $E^1 \leftarrow D \rightarrow E^2$ see Oxanilic acid, 4'-amino-5'-chloro-2-methoxy-

| | | |
|---|---|--|
| p-Phenylenediamine, 2,6-dichloro- | $C_6H_6Cl_2N_2$ | 37020 |
|  | Mol. wt. 177 | |
| p-Phenylenediamine, N,N-diethyl- | $C_{10}H_{16}N_2$ | 49705 50206, 50225, 50305, 50306 |
|  | Mol. wt. 164 | 51080 52050 |
| | Liquid, b.p. 260–262° | |
| p-Phenylenediamine, N,N-dimethyl- | $C_8H_{12}N_2$ | 11960, 16545, 16595 49405, 49410, 49700 |
|  | Mol. wt. 136 | 50040, 50205, 50210, 50265, 50431 51080, 51190 |
| | m.p. 41° | 52002, 52005, 52015, 52025, 52040, 52041, 52045, 52055, 52065 76075 |
| p-Phenylenediamine, N-ethyl- | $C_8H_{12}N_2$ | 16590 |
|  | Mol. wt. 136 | |
| p-Phenylenediamine, 2-methoxy-N¹-phenyl- | $C_{13}H_{14}N_2O$ | 37250 |
|  | Mol. wt. 214 | |
| p-Phenylenediamine, N-(o-methoxyphenyl)- | $C_{13}H_{14}N_2O$ | 76090 |
|  | Mol. wt. 214 | |
| | m.p. 80° | |
| p-Phenylenediamine, N-methyl- | $C_7H_{10}N_2$ | 16585 |
|  | Mol. wt. 122 | |
| | m.p. 35.5° b.p. 259.5° | |
| p-Phenylenediamine, 2-nitro- | $C_6H_7N_3O_2$ | 76070 |
|  | Mol. wt. 153 | For derived azo dyes <i>see</i> Acetanilide, 4-amino-3-nitro- |
| | m.p. 137° | |
| p-Phenylenediamine, N-phenyl- | $C_{12}H_{12}N_2$ | 10390, 18058 37240 |
|  | Mol. wt. 184 | 50055, 50235 76085 |
| | m.p. (from alcohol) 66–67° (from petrol ether) 75° | |

Phenylglycine

See Glycine, N-phenyl-

Phenylglycine-o-carboxylic acid

See Anthranilic acid, N-(carboxymethyl)-

Phenylglycine nitrile*See* Glycinonitrile, *N*-phenyl-**Phenyl mercaptan, *p*-chloro-***See* Benzenethiol, *p*-chloro-**Phloroglucinol***See* 1,3,5-Benzenetriol**Phosgene**

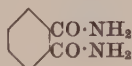
Mol. wt. 99

b.p. 8°

41000

42555, 42790

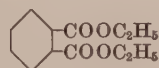
65435, 65600

Phthalamide

Mol. wt. 164

m.p. 220°

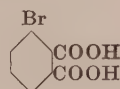
74160

Phthalic acid*See* Phthalic anhydride**Phthalic acid, diethyl ester**

Mol. wt. 222

Liquid, b.p. 288°

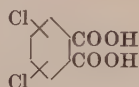
47000

Phthalic acid, 3-bromo-

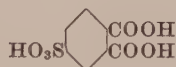
Mol. wt. 245

m.p. 138–140°

45456, 45457

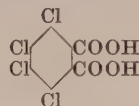
Phthalic acid, dichloro-

Mol. wt. 235

Phthalic acid, 4-sulfo-

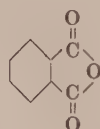
Mol. wt. 246

74220

Phthalic acid, 3,4,5,6-tetrachloro-Mol. wt. 304
(+ ½H₂O)

m.p. 252°

45410, 45420, 45440

Phthalic anhydride

Mol. wt. 148

m.p. 131.5°
b.p. 284.5°45165, 45166, 45170, 45210, 45300, 45305, 45310, 45315, 45350
45360, 45365, 45366, 45371, 45396, 45460, 45550, 45555

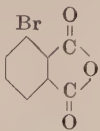
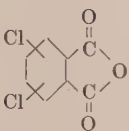
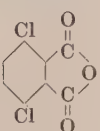
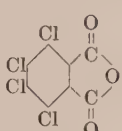
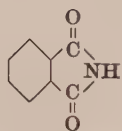
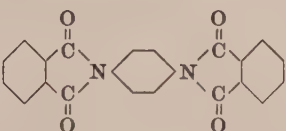

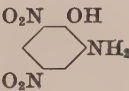
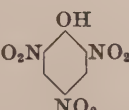
47000, 47010, 47015, 47020

53010, 58050, 58200, 58205, 59000

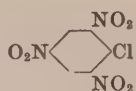
69400

70600, 70601, 74160

Phthalic acid,
m.p. 203°

| | | |
|---|----------------------------|---|
| Phthalic anhydride, 3-bromo- | $C_8H_3BrO_3$ | 45456, 45457 |
|  | Mol. wt. 227 | |
| Phthalic anhydride, dichloro- | $C_8H_2Cl_2O_3$ | 74255 |
|  | Mol. wt. 217 | |
| Phthalic anhydride, 3,6-dichloro- | $C_8H_2Cl_2O_3$ | 45405 |
|  | Mol. wt. 217 | |
| | m.p. 190–191° b.p. 339° | |
| Phthalic anhydride, 3,4,5,6-tetrachloro- | $C_8Cl_4O_3$ | 45410 74260 |
|  | Mol. wt. 286 | |
| | m.p. 255° | |
| Phthalimide | $C_8H_5NO_2$ | 73000 |
|  | Mol. wt. 147 | |
| | m.p. 234° | |
| Phthalimide, N,N'-p-phenylenedi- | $C_{22}H_{12}N_2O_4$ | 53095 |
|  | Mol. wt. 368 | |
| Phthalonitrile | $C_8H_4N_2$ | 74100, 74160, 74161, 74460 |
|  | Mol. wt. 128 | |
| 1,2-Phthaloylacridone <i>See</i> Naphth[2,3-c]acridan-5,8,14-trione | | |
| Picramic acid | $C_6H_5N_3O_6$ | 11170, 11290, 11300, 11335, 11395, 11700, 11820, 11830, 11835, 11836, 11837, 11845, 11875, 11880, 11890, 12050, 12200, 13255, 13260, 13265, 13295, 13330, 13360, 13361, 14655, 15950, 15951, 16065, 16070, 17125, 17235, 17236 |
|  | Mol. wt. 199 | 20260, 20380, 26965 |
| | m.p. 169° | 34905 53195, 53196, 53205, 53206 76540 |
| Picric acid | $C_6H_3N_3O_7$ | 53195, 53196, 53205, 53206 |
|  | Mol. wt. 229 | |
| | m.p. 122.5° | |

Picryl chloride $\text{C}_6\text{H}_2\text{ClN}_3\text{O}_6$ 10370, 10380, 10425



Mol. wt. 247.5

m.p. 83°

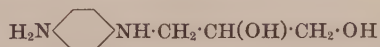
Primuline

See 7-Benzothiazolesulfonic acid,
2-[2-(*p*-aminophenyl)-6-benzothiazolyl]-6-methyl-

1,2-Propanediol, 3-(*p*-aminoanilino)-

$\text{C}_9\text{H}_{14}\text{N}_2\text{O}_2$

76080



Mol. wt. 182

1,2-Propanediol, 3-anilino-

$\text{C}_9\text{H}_{13}\text{NO}_2$

11090

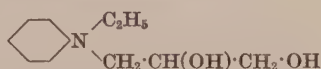


Mol. wt. 167

1,2-Propanediol, 3-(*N*-ethylanilino)-

$\text{C}_{11}\text{H}_{17}\text{NO}_2$

11118

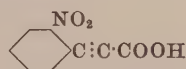


Mol. wt. 195

Propiolic acid, *o*-nitrophenyl-

$\text{C}_9\text{H}_5\text{NO}_4$

73000



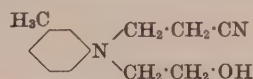
Mol. wt. 191

m.p. decomposes at 156°

Propionitrile, 3-[*N*-(2-hydroxyethyl)-*m*-toluidino]-

$\text{C}_{12}\text{H}_{16}\text{N}_2\text{O}$

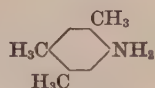
11230



Pseudocumidine

$\text{C}_9\text{H}_{13}\text{N}$

16155

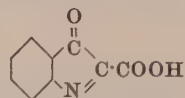


Mol. wt. 135

3*H*-Pseudoindole-2-carboxylic acid, 3-oxo-

$\text{C}_9\text{H}_5\text{NO}_3$

73820

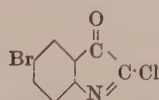


Mol. wt. 175

3-Pseudoindolone, 5-bromo-2-chloro-

$\text{C}_8\text{H}_3\text{BrClNO}$

73670



Mol. wt. 244.5

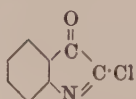
3-Pseudoindolone, 2-carboxy-

See 3*H*-Pseudoindole-2-carboxylic acid, 3-oxo-

3-Pseudoindolone, 2-chloro-

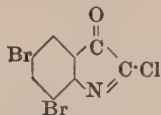
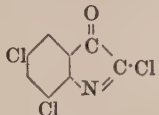
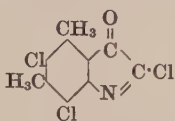
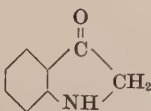
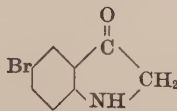
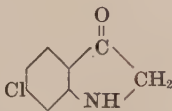
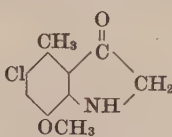
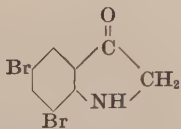
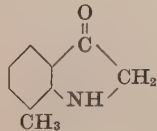
$\text{C}_8\text{H}_4\text{ClNO}$

73200, 73660



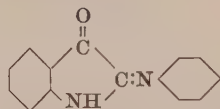
Mol. wt. 165.5

m.p. decomposes at 180°

| | | |
|---|--------------------|----------------------------|
| 3-Pseudoindolone, 5,7-dibromo-2-chloro- | $C_8H_2Br_2ClNO$ | 73810, 73815, 73820, 73855 |
|  | Mol. wt. 323.5 | |
| 3-Pseudoindolone, 2,5,7-trichloro- | $C_8H_2Cl_3NO$ | 73030, 73595, 73600, 73605 |
|  | Mol. wt. 234.5 | |
| 3-Pseudoindolone, 2,5,7-trichloro-4,6-dimethyl- | $C_{10}H_6Cl_3NO$ | 73805 |
|  | Mol. wt. 262.5 | |
| Pseudoindoxyl | C_8H_7NO | 73000, 73055, 73200 |
|  | Mol. wt. 133 | |
| Pseudoindoxyl, 5-bromo- (5-Bromoindoxyl) | C_8H_6BrNO | 73055 |
|  | Mol. wt. 212 | |
| Pseudoindoxyl, 6-chloro- | C_8H_6ClNO | 73030, 73205 |
|  | Mol. wt. 167.5 | |
| Pseudoindoxyl, 5-chloro-7-methoxy-4-methyl- | $C_{10}H_{10}ClNO$ | 73675, 73800 |
|  | Mol. wt. 195.5 | |
| Pseudoindoxyl, 5,7-dibromo- | $C_8H_5Br_2NO$ | 73210 |
|  | Mol. wt. 291 | |
| Pseudoindoxyl, 7-methyl- | C_9H_9NO | 73215 |
|  | Mol. wt. 147 | |

Pseudoindoxyl, 2-(phenylimino)- $C_{14}H_{10}NO$

73000, 73610, 73615, 73620, 73625, 73630, 73685, 73825, 73830, 73855

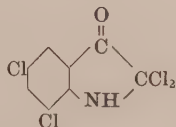


Mol. wt. 222

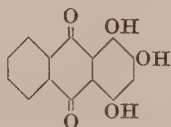
m.p. 126°

Pseudoindoxyl, 2,2,5,7-tetrachloro- $C_8H_3Cl_4NO$

73665

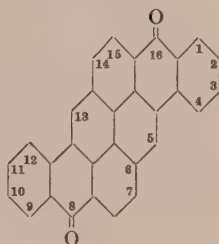


Mol. wt. 271

Purpurin $C_{14}H_8O_5$ 58210, 58215
60885, 63615

Mol. wt. 256

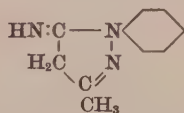
m.p. 259°

3-Purpurinsulfonic acid*See 2-Anthraquinonesulfonic acid, 1,3,4-trihydroxy-***8,16-Pyranthredione** $C_{30}H_{14}O_2$ 59705, 59706, 59710, 59711, 59715
65230

Mol. wt. 406

Pyranthrone*See 8,16-Pyranthredione***2-Pyrazoline, 5-imino-3-methyl-1-phenyl-** $C_{10}H_{11}N_3$

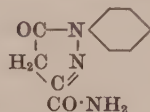
24565



Mol. wt. 173

2-Pyrazoline-3-carboxamide, 5-oxo-1-phenyl- $C_{10}H_9N_3O_2$

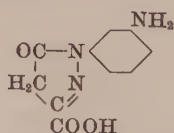
19240, 19245



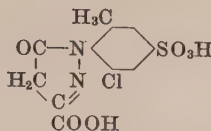
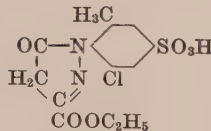
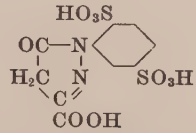
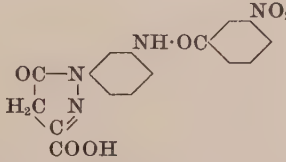
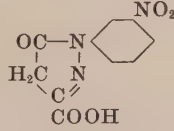
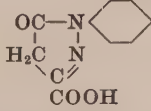
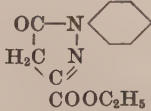
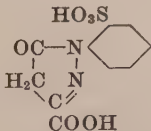
Mol. wt. 203

**2-Pyrazoline-3-carboxylic acid,
1-(*m*-aminophenyl)-5-oxo-** $C_{10}H_9N_3O_3$

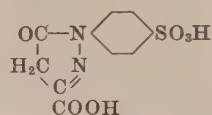
34300



Mol. wt. 219

| | | |
|---|-------------------------|---|
| 2-Pyrazoline-3-carboxylic acid, 1-(6-chloro-4-sulfo-o-tolyl)-5-oxo- | $C_{10}H_9ClN_2O_6S$ | 19180, 19185 |
|  | Mol. wt. 334.5 | |
| 2-Pyrazoline-3-carboxylic acid, 1-(6-chloro-4-sulfo-o-tolyl)-5-oxo-, ethyl ester | $C_{13}H_{13}ClN_2O_6S$ | 19230 |
|  | Mol. wt. 360.5 | |
| 2-Pyrazoline-3-carboxylic acid, 1-(2,5-disulfo-phenyl)-5-oxo- | $C_{10}H_8N_2O_9S_2$ | 19170 |
|  | Mol. wt. 364 | |
| 2-Pyrazoline-3-carboxylic acid, 1-[m-(m-nitrobenzamido)phenyl]-5-oxo- | $C_{17}H_{12}N_4O_6$ | 32040 |
|  | Mol. wt. 368 | |
| 2-Pyrazoline-3-carboxylic acid, 1-(m-nitrophenyl)-5-oxo- | $C_{10}H_7N_3O_5$ | 23070, 25200, 25225, 25440, 28660 32035, 32040 |
|  | Mol. wt. 249 | |
| 2-Pyrazoline-3-carboxylic acid, 5-oxo-1-phenyl- | $C_{10}H_8N_2O_3$ | 25220, 25240, 28650 |
|  | Mol. wt. 204 | |
| 2-Pyrazoline-3-carboxylic acid, 5-oxo-1-phenyl-, ethyl ester | $C_{12}H_{12}N_2O_3$ | 21080, 21120, 21210 |
|  | Mol. wt. 232 | |
| 2-Pyrazoline-3-carboxylic acid, 5-oxo-1-(o-sulfo-phenyl)- | $C_{10}H_8N_2O_6S$ | 19120 |
|  | Mol. wt. 284 | |

2-Pyrazoline-3-carboxylic acid, 5-oxo-1-(*p*-sulfophenyl)- $C_{10}H_8N_2O_6S$ 19130, 19135, 19140, 19145, 19150, 19160 22370

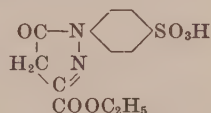


Mol. wt. 284

2-Pyrazoline-3-carboxylic acid, 5-oxo-1-(*p*-sulfophenyl)-, ethyl ester

$C_{12}H_{12}N_2O_6S$

19200, 19205, 19210, 19235

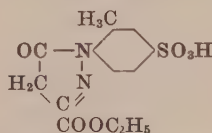


Mol. wt. 312

2-Pyrazoline-3-carboxylic acid, 5-oxo-1-(4-sulfo-*o*-tolyl)-, ethyl ester

$C_{13}H_{14}N_2O_6S$

19220



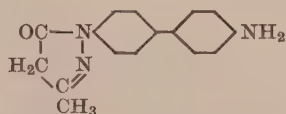
1,9-Pyrazoloanthrone

See Anthra[1,9]pyrazol-6(2*H*)-one

5-Pyrazolone, 1-(4'-amino-4-biphenyl)-3-methyl-

$C_{16}H_{15}N_3O$

29295



Mol. wt. 265

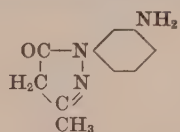
5-Pyrazolone, 1-(*m*-aminophenyl)-3-methyl-

$C_{10}H_{11}N_3O$

19000

25250, 25350, 25435

32035

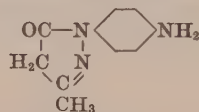


Mol. wt. 189

5-Pyrazolone, 1-(*p*-aminophenyl)-3-methyl-

$C_{10}H_{11}N_3O$

29290



Mol. wt. 189

5-Pyrazolone, 1-(*m*-aminophenyl)-3-carboxy-

See 2-Pyrazoline-3-carboxylic acid, 1-(*m*-aminophenyl)-5-oxo-

5-Pyrazolone, 3-carbamoyl-1-phenyl-

See 2-Pyrazoline-3-carboxamide, 5-oxo-1-phenyl-

5-Pyrazolone, 3-carbethoxy-1-(6-chloro-4-sulfo-*o*-tolyl)-

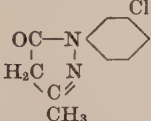
See 2-Pyrazoline-3-carboxylic acid, 1-(6-chloro-4-sulfo-*o*-tolyl)-5-oxo-, ethyl ester

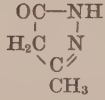
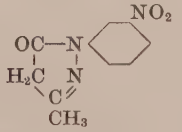
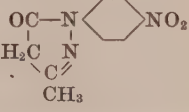
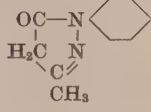
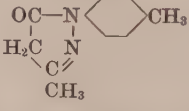
5-Pyrazolone, 3-carbethoxy-1-phenyl-

See 2-Pyrazoline-3-carboxylic acid, 5-oxo-1-phenyl-, ethyl ester

5-Pyrazolone, 3-carbethoxy-1-(*p*-sulfophenyl)-

See 2-Pyrazoline-3-carboxylic acid, 5-oxo-1-(*p*-sulfophenyl)-, ethyl ester

| | | |
|---|-------------------|-------|
| 5-Pyrazolone, 3-carboxy-1-(6-chloro-4-sulfo-o-tolyl)- | | |
| <i>See</i> 2-Pyrazoline-3-carboxylic acid, 1-(6-chloro-4-sulfo-o-tolyl)-5-oxo- | | |
| 5-Pyrazolone, 3-carboxy-1-(2,5-disulfophenyl)- | | |
| <i>See</i> 2-Pyrazoline-3-carboxylic acid, 1-(2,5-disulfophenyl)-5-oxo- | | |
| 5-Pyrazolone, 1-[2-(3-carboxy-4-hydroxyphenylsulfonyl)-5-sulfophenyl]-3-methyl- | | |
| <i>See</i> Salicylic acid, 5-[2-(3-methyl-5-oxo-2-pyrazolin-1-yl)-4-sulfophenylsulfonyl]- | | |
| 5-Pyrazolone, 1-(3-carboxy-2-hydroxy-5-sulfophenyl)-3-methyl- | | |
| <i>See</i> Salicylic acid, 3-(3-methyl-5-oxo-2-pyrazolin-1-yl)-5-sulfo- | | |
| 5-Pyrazolone, 3-carboxy- 1-(<i>m</i>-nitrophenyl)- | | |
| <i>See</i> 2-Pyrazoline-3-carboxylic acid, 1-(<i>m</i> -nitrophenyl)-5-oxo- | | |
| 5-Pyrazolone, 3-carboxy-1-phenyl- | | |
| <i>See</i> 2-Pyrazoline-3-carboxylic acid, 5-oxo-1-phenyl- | | |
| 5-Pyrazolone, 1-[<i>m</i>-(<i>o</i>-carboxyphenylsulfamoyl)phenyl]-3-methyl- | | |
| <i>See</i> Anthranilic acid, <i>N</i> -[<i>m</i> -(3-methyl-5-oxo-2-pyrazolin-1-yl)phenylsulfonyl]- | | |
| 5-Pyrazolone, 3-carboxy-1-(<i>o</i>-sulfophenyl)- | | |
| <i>See</i> 2-Pyrazoline-3-carboxylic acid, 5-oxo-1-(<i>o</i> -sulfophenyl)- | | |
| 5-Pyrazolone, 3-carboxy-1-(<i>p</i>-sulfophenyl)- | | |
| <i>See</i> 2-Pyrazoline-3-carboxylic acid, 5-oxo-1-(<i>p</i> -sulfophenyl)- | | |
| 5-Pyrazolone, 1-(<i>m</i>-chlorophenyl)-3-methyl- | $C_{10}H_9ClN_2O$ | 18940 |
| <div style="display: flex; align-items: center; justify-content: center;">  <div style="margin-left: 20px;">Mol. wt. 208.5</div> </div> | | |
| 5-Pyrazolone, 1-(2-chloro-4-sulfophenyl)-3-methyl- | | |
| <i>See</i> Benzenesulfonic acid, 3-chloro-4-(3-methyl-5-oxo-2-pyrazolin-1-yl)- | | |
| 5-Pyrazoione, 1-(2-chloro-5-sulfophenyl)-3-methyl- | | |
| <i>See</i> Benzenesulfonic acid, 4-chloro-3-(3-methyl-5-oxo-2-pyrazolin-1-yl)- | | |
| 5-Pyrazolone, 1-(4-chloro-2-sulfophenyl)-3-methyl- | | |
| <i>See</i> Benzenesulfonic acid, 5-chloro-2-(3-methyl-5-oxo-2-pyrazolin-1-yl)- | | |
| 5-Pyrazolone, 1-(6-chloro-4-sulfo-o-tolyl)-3-methyl- | | |
| <i>See m</i> -Toluenesulfonic acid, 5-chloro-4-(3-methyl-5-oxo-2-pyrazolin-1-yl)- | | |
| 5-Pyrazolone, 1-(2,5-dichloro-4-sulfophenyl)-3-methyl- | | |
| <i>See</i> Benzenesulfonic acid, 2,5-dichloro-4-(3-methyl-5-oxo-2-pyrazolin-1-yl)- | | |
| 5-Pyrazolone, 1-(4,8-disulfo-2-naphthyl)-3-methyl- | | |
| <i>See</i> 1,5-Naphthalenedisulfonic acid, 3-(3-methyl-5-oxo-2-pyrazolin-1-yl)- | | |
| 5-Pyrazolone, 1-(5,7-disulfo-2-naphthyl)-3-methyl- | | |
| <i>See</i> 1,3-Naphthalenedisulfonic acid, 6-(3-methyl-5-oxo-2-pyrazolin-1-yl)- | | |

| | | |
|---|--------------------|---|
| 5-Pyrazolone, 3-methyl- | $C_4H_6N_2O$ | 12690, 12695, 12696, 18670 |
|  | Mol. wt. 98 | |
| 5-Pyrazolone, 3-methyl-1-[<i>p</i> -(6-methyl-7-sulfo-2-benzothiazolyl)phenyl]- | | |
| <i>See</i> 7-Benzothiazolesulfonic acid, 6-methyl-2-[<i>p</i> -(3-methyl-5-oxo-2-pyrazolin-1-yl)phenyl]- | | |
| 5-Pyrazolone, 3-methyl-1-(<i>m</i> -nitrophenyl)- | $C_{10}H_9N_3O_3$ | 12750, 19000 |
|  | Mol. wt. 219 | |
| 5-Pyrazolone, 3-methyl-1-(<i>p</i> -nitrophenyl)- | $C_{10}H_9N_3O_3$ | 12750 |
|  | Mol. wt. 219 | |
| 5-Pyrazolone, 3-methyl-1-phenyl- | $C_{10}H_{10}N_2O$ | 12700, 12705, 12710, 12712, 12714, 12715, 12716, 12720, 12730, 12740, 18690, 18695, 18700, 18710, 18720, 18730, 18735, 18736, 18740, 18744, 18745, 18750, 18760, 18761, 18762, 18765, 18770, 18775, 18780 |
|  | Mol. wt. 174 | 21110, 21200, 22790, 22895, 22910, 26140, 28670 |
| | m.p. 127° | 34290, 34295 |
| | | 43845, 44525 |
| 5-Pyrazolone, 3-methyl-1-(<i>m</i> -sulfamoylphenyl)- | | |
| <i>See</i> Benzenesulfonamide, <i>m</i> -(3-methyl-5-oxo-2-pyrazolin-1-yl)- | | |
| 5-Pyrazolone, 3-methyl-1-(6-sulfo-2-naphthyl)- | | |
| <i>See</i> 2-Naphthalenesulfonic acid, 6-(3-methyl-5-oxo-2-pyrazolin-1-yl)- | | |
| 5-Pyrazolone, 3-methyl-1-(<i>m</i> -sulfophenyl)- | | |
| <i>See</i> Benzenesulfonic acid, <i>m</i> -(3-methyl-5-oxo-2-pyrazolin-1-yl)- | | |
| 5-Pyrazolone, 3-methyl-1-(<i>o</i> -sulfophenyl)- | | |
| <i>See</i> Benzenesulfonic acid, <i>o</i> -(3-methyl-5-oxo-2-pyrazolin-1-yl)- | | |
| 5-Pyrazolone, 3-methyl-1-(<i>p</i> -sulfophenyl)- | | |
| <i>See</i> Benzenesulfonic acid, <i>p</i> -(3-methyl-5-oxo-2-pyrazolin-1-yl)- | | |
| 5-Pyrazolone, 3-methyl-1-(4-sulfo- <i>o</i> -tolyl)- | | |
| <i>See m</i> -Toluenesulfonic acid, 4-(3-methyl-5-oxo-2-pyrazolin-1-yl)- | | |
| 5-Pyrazolone, 3-methyl-1-(2,3,6-trichloro-5-sulphophenyl)- | | |
| <i>See</i> Benzenesulfonic acid, 2,4,5-trichloro-3-(3-methyl-5-oxo-2-pyrazolin-1-yl)- | | |
| 5-Pyrazolone, 3-methyl-1- <i>p</i> -tolyl- | $C_{11}H_{12}N_2O$ | 21115, 21205 |
|  | Mol. wt. 188 | |

5-Pyrazolone, 3-phenyl-1-(o-sulfophenyl)-

See Benzenesulfonic acid, o-(5-oxo-3-phenyl-2-pyrazolin-1-yl)-

1-Pyrenamine

$C_{16}H_{11}N$ 51310



Mol. wt. 217

m.p. 117–118°

Pyrene

$C_{16}H_{10}$ 59050, 59051, 59700



Mol. wt. 202

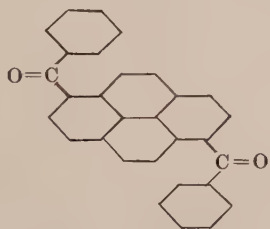
m.p. 149–150°

Pyrene, amino-

See 1-Pyrenamine

Pyrene, 1,6-dibenzoyl-

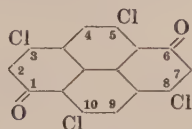
$C_{30}H_{18}O_2$ 59700, 59701



Mol. wt. 410

1,6-Pyrenedione, 3,5,8,10-tetrachloro-

$C_{16}H_4Cl_4O_2$ 59050, 59051



Mol. wt. 370

m.p. 320–325°

1,3,6,8-Pyrenetetrasulfonic acid

$C_{16}H_{10}S_4O_{12}$ 59040



Mol. wt. 522

Pyridine

C_5H_5N 42525
51320

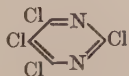


Mol. wt. 79

m.p. –42°
b.p. 115°

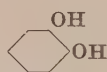
Pyrimidine, 2,4,5,6-tetrachloro-

$C_4Cl_4N_2$ 18155



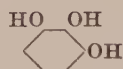
Mol. wt. 218

Pyrocatechol

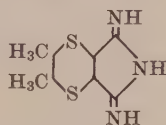


$C_6H_8O_2$ 14260
53218
76500
Mol. wt. 110
m.p. 105°
b.p. 240°

Pyrogallol



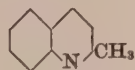
$C_6H_8O_3$ 11950, 11955, 11960, 11965
14340
45445, 45505
55015
57000, 57005
76515
Mol. wt. 126
m.p. 132.5–134.5°

Pyrrolo[3,4-b]-p-dithiin,
5,7-dihydro-5,7-diimino-2,3-dimethyl-

$C_8H_9N_3S_2$ See Ingrain Blue 7
Mol. wt. 211

Q

Quinaldine



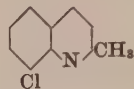
$C_{10}H_9N$ 47000, 47040
Mol. wt. 143
m.p. -2°
b.p. 247.6°

Quinaldine, 6-chloro-



$C_{10}H_8ClN$ 47010
Mol. wt. 177.5
m.p. 91°

Quinaldine, 8-chloro-



$C_{10}H_8ClN$ 47015
Mol. wt. 177.5
m.p. 68–70°

Quinaldine, 3-hydroxy-

See 3-Quinolinol, 2-methyl-

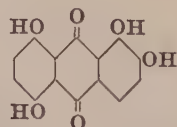
Quinaldine, 6-methyl-

See *p*-Toluquinaldine

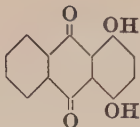
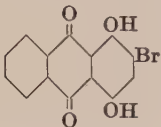
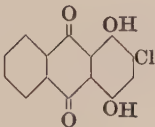
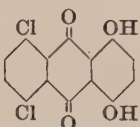
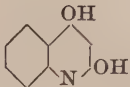
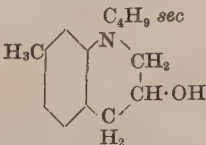
Quinaldine, β -naphtho-

See Benzo[*f*]quinoline, 3-methyl-

Quinalizarin

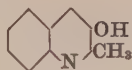


$C_{14}H_6O_4$ 58520, 58550, 58615
60880, 62555, 62580
Mol. wt. 272
m.p. >275°

| | | |
|---|------------------------------------|--|
| Quinizarin | $C_{14}H_8O_4$ | 58055, 58060, 58500 60710, 60715, 60725, 60730, 60735, 61100, 61105, 61500, 61505, 61510, 61545, 61551, 61555, 61560, 61565, 61570, 61575, 61580, 61590, 61595, 62005 |
|  | Mol. wt. 240 m.p. 200–202° | |
| Quinizarin, 2-bromo- | $C_{14}H_7BrO_4$ | 58225, 63615, 63620 |
|  | Mol. wt. 319 m.p. 265–268° | |
| Quinizarin, 2-chloro- | $C_{14}H_7ClO_4$ | 63615, 63620 |
|  | Mol. wt. 274.5 m.p. 239–240° | |
| Quinizarin, 5,8-dichloro- | $C_{14}H_6Cl_2O_4$ | 62560, 62565, 62570 |
|  | Mol. wt. 309 m.p. 239° (208) | |
| 2-Quinizarincarboxylic acid | | |
| <i>See 2-Anthraquinonecarboxylic acid, 1,4-dihydroxy-</i> | | |
| 6-Quinizarinsulfonic acid | | |
| <i>See 2-Anthraquinonesulfonic acid, 5,8-dihydroxy-</i> | | |
| Quinoline, 2,6-dimethyl- | | |
| <i>See p-Toluquinaldine</i> | | |
| Quinoline, α-methyl- | | |
| <i>See Quinaldine</i> | | |
| Quinoline, 2-methyl- | | |
| <i>See Quinaldine</i> | | |
| Quinoline, 3-methylbenzo[<i>f</i>]- | | |
| <i>See Benzo[<i>f</i>]quinoline, 3-methyl-</i> | | |
| 2,4-Quinolinediol | $C_9H_7NO_2$ | 12770, 12775, 12780, 12783, 19340, 19345, 19350, 19351, 19355 28690 30355, 34285 |
|  | Mol. wt. 161 | |
| 3-Quinolinelol, 1-<i>sec</i>-butyl-1,2,3,4-tetrahydro-7-methyl- | $C_{14}H_{21}NO$ | 11410 |
|  | Mol. wt. 219 | |

3-Quinolinol, 2-methyl- $C_{10}H_9NO$

47020



Mol. wt. 159

m.p. Two compounds described melting at 203–205° and 260°

8-Quinolinol C_9H_7NO

19320, 19325

28685, 28686



Mol. wt. 145

p-Quinone $C_6H_4O_2$

56000, 56005

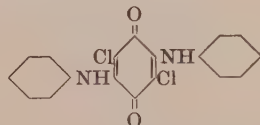


Mol. wt. 108

m.p. 115.7°
b.p. sublimes

p-Quinone, 2,5-dianilino-3,6-dichloro- $C_{18}H_{12}Cl_2N_2O_2$

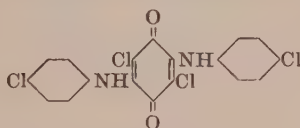
56010, 56011, 56012



Mol. wt. 359

p-Quinone, 2,5-dichloro-3,6-bis(p-chloroanilino)- $C_{18}H_{10}Cl_4N_2O_2$

56015, 56016, 56017



Mol. wt. 428

5,8-Quinone, dibenzpyrene-

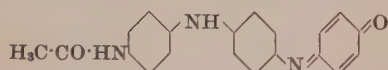
See Dibenzo[a,i]pyrene-5,8-dione

p-Quinone diimine-N-sulfonic acid, N'-phenyl-

See 2,5-Cyclohexadiene- Δ^1 ,N-sulfamic acid, 4-phenylimino-

p-Quinone imine, N-[p-(p-acetamidoanilino)phenyl]- $C_{20}H_{17}N_3O_2$

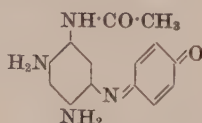
53460, 53461



Mol. wt. 331

p-Quinone imine, N-(5-acetamido-2,4-diaminophenyl)- $C_{14}H_{14}N_4O_2$

53410, 53411

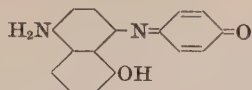


Mol. wt. 270

p-Quinone imine, N-(4-amino-8-hydroxy-1-naphthyl)-

$C_{16}H_{12}N_2O_2$

53451, 53520

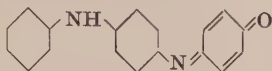


Mol. wt. 288

p-Quinone imine, N-(p-anilinophenyl)-

$C_{18}H_{14}N_2O$

53450, 53451, 53452

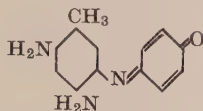


Mol. wt. 274

p-Quinone imine, N-(4,6-diamino-m-tolyl)-

$C_{13}H_9N_3O_5$

53442



Mol. wt. 287

p-Quinone imine, N-(p-hydroxyphenyl)-

See Indophenol

R

R acid

See 2-Naphthol-3,6-disulfonic acid

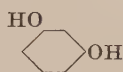
2R acid

See 1-Naphthol-3,6-disulfonic acid, 7-amino-

Resorcinol

$C_6H_6O_2$

10000



Mol. wt. 110

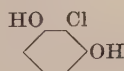
m.p. 119°

11920, 11930, 11935, 11940, 14270, 14275, 14290, 14295, 14300, 14305
20018, 20020, 20025, 20160, 20170, 20175, 20180, 20185, 20190, 20195, 20200, 20210, 20215, 20216, 20220, 20230, 20250, 20255, 20260, 20265, 21060, 21150, 21610, 22255, 22855, 22860, 23515, 24920, 25055, 25265, 25430, 26570, 26575, 26580
30135, 30140, 30145, 30150, 30155, 30160, 30165, 30370, 31520, 31525, 31530, 31605, 31610, 31615, 31620, 31745, 31750, 31755, 31895, 31945, 32020, 32025, 32045, 33520, 33525, 33530, 34050, 34055, 34060, 34900, 34905, 34907
35025, 35030, 35065, 35100, 35290, 35310, 35800, 36020
40015
43520
45315, 45350, 45360, 45390, 45396, 45405, 45410
51020, 51130, 51140, 51400
76505

Resorcinol, 2-chloro-

$C_6H_5ClO_2$

45365

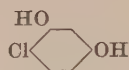


Mol. wt. 144.5

m.p. 97-98°
(sublimes)

Resorcinol, 4-chloro- $C_6H_5ClO_2$

76510



Mol. wt. 144.5

m.p. 89°
b.p. 259°**Resorcinol, 4-nitroso-** $C_6H_5NO_3$

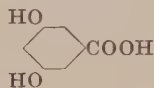
51400



Mol. wt. 139

 α -Resorcylic acid $C_7H_6O_4$

55000



Mol. wt. 154

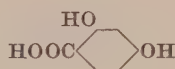
m.p. 233°

 β -Resorcylic acid $C_7H_6O_4$

14320, 14325

20280

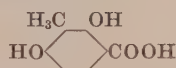
45305, 45456, 45457



Mol. wt. 154

m.p. 213°
(anhydrous) **β -Resorcylic acid, 3-methyl-** $C_8H_8O_4$

45450, 45455

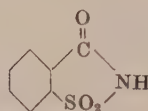


Mol. wt. 168

S

S acid*See* 1-Naphthol-5-sulfonic acid, 8-amino-**S acid, *N*-acetyl-***See* 1-Naphthol-5-sulfonic acid, 8-acetamido-**S acid, *N*-benzoyl-***See* 1-Naphthol-5-sulfonic acid, 8-benzamido-**S acid, *N*-*p*-tolyl-***See* 1-Naphthol-5-sulfonic acid, 8-*p*-toluidino-**S acid, *N*-*p*-tosyl-***See* 1-Naphthol-5-sulfonic acid, 8-*p*-tolylsulfonamido-**Saccharin** $C_7H_5NO_3S$

45070

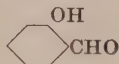


Mol. wt. 183

m.p. 220°

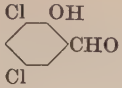
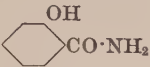
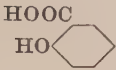
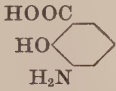
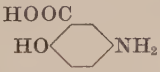


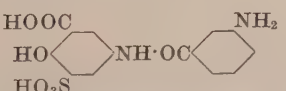
Salicylaldehyde $C_7H_6O_2$

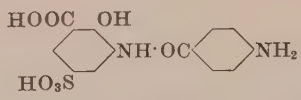
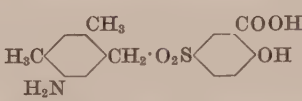
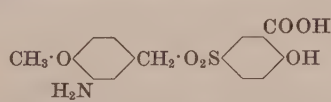
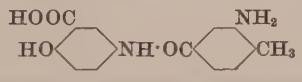
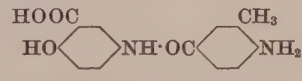
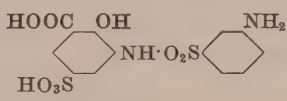
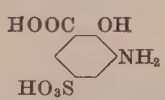
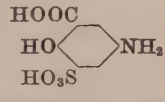
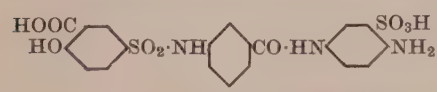
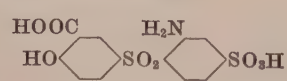
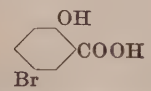
48045

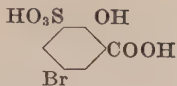
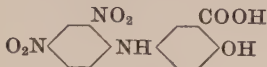
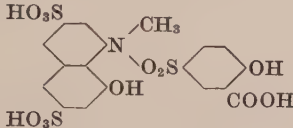
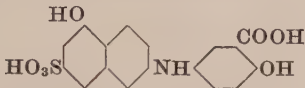
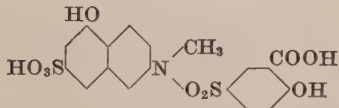
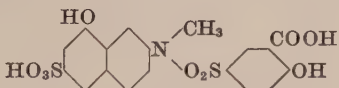
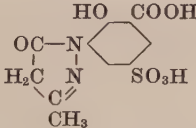
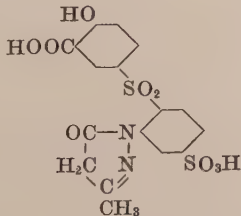


Mol. wt. 122

m.p. -21°
b.p. 196.5°

| | | |
|---|----------------------------|--|
| Salicylaldehyde, 3,5-dichloro- | $C_7H_4Cl_2O_2$ | 48050 |
|  | Mol. wt. 191 | |
| | m.p. 95° | |
| Salicylamide | $C_7H_7NO_2$ | 43815 |
|  | Mol. wt. 137 | |
| | m.p. 142° b.p. sublimes | |
| Salicylic acid | $C_7H_6O_3$ | 13990, 13995, 14000, 14005, 14006, 14007, 14010, 14015, 14020, 14025, 14030, 14035, 14040, 14045, 14050, 14055, 14058, 14060, 14070, 14075, 14080, 14085, 14090, 14091, 14095, 14100, 14101, 14105, 14110, 14115, 14130, 14135, 14140, 14150, 14155 |
|  | Mol. wt. 138 | |
| | m.p. 156° | 20150, 20151, 21545, 21550, 21555, 21570, 21571, 21575, 21610, 22010, 22130, 22165, 22175, 22250, 22255, 22260, 22270, 22275, 22280, 22285, 22290, 22300, 22305, 22306, 22310, 22311, 22315, 22320, 22325, 22330, 22335, 22340, 22345, 22360, 22370, 22375, 22380, 22385, 22390, 22775, 22855, 22880, 23090, 23091, 23095, 23100, 23105, 23130, 23275, 23375, 23640, 23645, 23650, 23655, 24010, 24850, 24910, 25010, 25100, 25130, 25210, 25215, 25220, 25225, 25300, 25700, 26520, 26530, 26531, 26540, 26545, 29000, 29005, 29010 |
| | | 30005, 30045, 30050, 30055, 30060, 30065, 30095, 30100, 30115, 30135, 30140, 30145, 30150, 30155, 30160, 30165, 30190, 30195, 30210, 30215, 30220, 30310, 30315, 30320, 30325, 30360, 30380, 30385, 30400, 31695, 31700, 31705, 31710, 31715, 31720, 31725, 31730, 31735, 31740, 31745, 31750, 31755, 31760, 31765, 31770, 31775, 31780, 31785, 31790, 31793, 31795, 31885, 31890, 32025, 32030, 32035, 32040, 34040, 34045, 34950, 34960 |
| | | 35220, 35225, 35530, 35535, 35650, 35660, 35670, 35680, 35710, 35715, 35720, 36030, 36040, 36210, 36220, 36300 |
| | | 42175, 43500, 43810, 43815, 43866 |
| | | 58505 |
| | | 60520 |
| Salicylic acid, 3-amino- | $C_7H_7NO_3$ | 26260, 26695, 26751, 27270, 27520, 27720, 28450 |
|  | Mol. wt. 153 | 30080 |
| Salicylic acid, 5-amino- | $C_7H_7NO_3$ | 26260, 26500, 26695, 26750, 26751, 27080, 27270, 27520, 27720, 28350, 28450 |
|  | Mol. wt. 153 | 30080, 33540, 33560, 34000, 34135, 34155 |
| | | 35750, 35770, 35775, 35810, 36250 |
| | | 43505, 56210 |
| | Decomposes at 280° | |
| Salicylic acid, 5-(<i>m</i> -aminobenzamido)- | $C_{14}H_{12}N_2O_4$ | 17970 |
|  | Mol. wt. 272 | 62140 |
| Salicylic acid, 5-(<i>p</i> -aminobenzamido)- | $C_{14}H_{12}N_2O_4$ | 28375 |
|  | Mol. wt. 272 | |
| Salicylic acid, 5-(<i>m</i> -aminobenzamido)-3-sulfo- | $C_{14}H_{12}N_2O_7S$ | 17975 |
|  | Mol. wt. 352 | |

| | | |
|---|-------------------------|--|
| Salicylic acid, 3-(<i>p</i> -aminobenzamido)-5-sulfo- | $C_{14}H_{12}N_2O_7S$ | 29020 |
|  | Mol. wt. 352 | |
| Salicylic acid, 5-(5-amino-2,4-dimethylbenzylsulfonyl)- | $C_{16}H_{17}NO_5S$ | 62115 |
|  | Mol. wt. 335 | |
| Salicylic acid, 5-(3-amino-4-methoxybenzylsulfonyl)- | $C_{15}H_{15}NO_6S$ | 62140 |
|  | Mol. wt. 337 | |
| Salicylic acid, 5-(3-amino-4-methylbenzamido)- | $C_{15}H_{14}N_2O_4$ | 16220 |
|  | Mol. wt. 286 | |
| Salicylic acid, 5-(4-amino-3-methylbenzamido)- | $C_{15}H_{14}N_2O_4$ | 17830 |
|  | Mol. wt. 286 | |
| Salicylic acid, 3-(<i>m</i> -aminophenylsulfonamido)-5-sulfo- | $C_{13}H_{12}N_2O_8S_2$ | 18670 |
|  | Mol. wt. 388 | |
| Salicylic acid, 3-amino-5-sulfo- | $C_7H_7NO_6S$ | 10425 14740 |
|  | Mol. wt. 233 | 26530, 26531, 26950, 26960 30165, 34120 |
| Salicylic acid, 5-amino-3-sulfo- | $C_7H_7NO_6S$ | 14295, 17890 26700 |
|  | Mol. wt. 233 | 34040, 34225 74440 |
| Salicylic acid, 5-[<i>m</i> -(4-amino-3-sulfophenylcarbamoyl)phenylsulfamoyl]- | $C_{20}H_{17}N_3O_9S_2$ | 17047 |
|  | Mol. wt. 507 | |
| Salicylic acid, 5-(2-amino-4-sulfophenylsulfonyl)- | $C_{13}H_{11}NO_8S_2$ | 17075 |
|  | Mol. wt. 373 | |
| Salicylic acid, 5-bromo- | $C_7H_5BrO_3$ | 10300 |
|  | Mol. wt. 217 | |

| | | |
|---|--------------------------|-----------------------|
| Salicylic acid, 5-bromo-3-sulfo- | $C_7H_5BrO_6S$ | 10301 |
|  | Mol. wt. 297 | |
| Salicylic acid, 5-(2,4-dinitroanilino)- | $C_{13}H_9N_3O_7$ | 53255 |
|  | Mol. wt. 319 | |
| Salicylic acid, 5-[N-(8-hydroxy-3,6-disulfo-1-naphthyl)-N-methylsulfamoyl]- | $C_{18}H_{15}NO_{12}S_8$ | 28490 |
|  | Mol. wt. 533 | |
| Salicylic acid, 5-(5-hydroxy-7-sulfo-2-naphthylamino)- | $C_{17}H_{13}NO_7S$ | 24420, 27980 |
|  | Mol. wt. 375 | |
| Salicylic acid, 5-[N-(5-hydroxy-7-sulfo-2-naphthyl)-N-methylsulfamoyl]- | $C_{18}H_{15}NO_9S_2$ | 28410, 28415 |
|  | Mol. wt. 453 | |
| Salicylic acid, 5-[N-(8-hydroxy-6-sulfo-2-naphthyl)-N-methylsulfamoyl]- | $C_{18}H_{15}NO_9S_2$ | 28420 |
|  | Mol. wt. 453 | |
| Salicylic acid, 3-(3-methyl-5-oxo-2-pyrazolin-1-yl)-5-sulfo- | $C_{11}H_{10}N_2O_7S$ | 19060, 19065 23310 |
|  | Mol. wt. 314 | |
| Salicylic acid, 5-[2-(3-methyl-5-oxo-2-pyrazolin-1-yl)-4-sulphophenylsulfonyl]- | $C_{17}H_{14}N_2O_9S_2$ | 19070, 19075, 19080 |
|  | Mol. wt. 454 | |

Schaeffer's acid

See 2-Naphthol-6-sulfonic acid

Skatole

See Indole, 3-methyl-

Stearoyl chloride



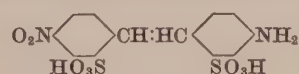
$\text{C}_{18}\text{H}_{35}\text{ClO}$

59845

Mol. wt. 302.5

m.p. 23°

2,2'-Stilbenedisulfonic acid, 4-amino-4'-nitro-



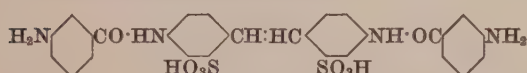
$\text{C}_{14}\text{H}_{12}\text{N}_2\text{O}_8\text{S}_2$

25030, 27970

31980, 31985

Mol. wt. 400

2,2'-Stilbenedisulfonic acid,
4,4'-bis(m-aminobenzamido)-

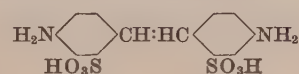


$\text{C}_{28}\text{H}_{24}\text{N}_4\text{O}_8\text{S}_2$

24920

Mol. wt. 608

2,2'-Stilbenedisulfonic acid, 4,4'-diamino-



$\text{C}_{14}\text{H}_{14}\text{N}_2\text{O}_6\text{S}_2$

24860, 24865, 24870, 24875, 24880, 24885, 24890, 24895, 24900, 24910

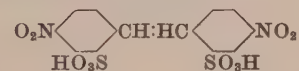
36900

Mol. wt. 418

40600, 40615, 40618, 40620, 40621, 40622, 40630, 40647

See also 2,2'-Stilbenedisulfonic acid, 4-amino-4'-nitro-

2,2'-Stilbenedisulfonic acid, 4,4'-dinitro-



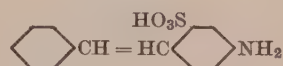
$\text{C}_{14}\text{H}_{10}\text{N}_2\text{O}_{10}\text{S}_2$

40001, 40002, 40003, 40004, 40005, 40006, 40045, 40050, 40055, 40205, 40210, 40215, 40220, 40230, 40235, 40240, 40245, 40265, 40270, 40275, 40290, 40291, 40295, 40500

See also dyes from o-Toluenesulfonic acid, 5-nitro-

Mol. wt. 430

2-Stilbenesulfonic acid, 4-amino-

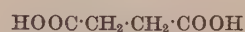


$\text{C}_{14}\text{H}_{13}\text{NO}_3\text{S}$

40645

Mol. wt. 275

Succinic acid



$\text{C}_4\text{H}_6\text{O}_4$

65400

Mol. wt. 118

m.p. $184-185^\circ$

Succinic anhydride



$\text{C}_4\text{H}_4\text{O}_3$

45050

Mol. wt. 100

m.p. 119.6°
b.p. 261°


Sulfanilamide




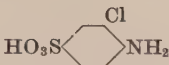
$\text{C}_6\text{H}_8\text{N}_2\text{O}_2\text{S}$

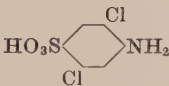
13056, 13379

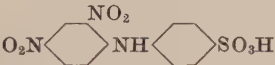
Mol. wt. 172


| | | |
|---|---------------|--|
| Sulfanilic acid | $C_6H_7NO_3S$ | 13010, 13025, 13080, 13085, 13090, 13091, 13095, 13096, 13220, 13290, 14010, 14180, 14600, 15510, 15511, 15985, 16540, 17595, 17596, 18105, 18695, 18895, 18965, 18972, 19020, 19140, 19205, 19340 |
|  | Mol. wt. 173 | 20070, 20080, 20120, 20140, 20150, 20160, 20170, 20175, 20190, 20200, 20210, 20281, 20300, 20340, 20345, 20350, 20475, 20480, 22010, 26280, 26440, 26770, 26920, 27060, 27180, 27225, 27510, 27755, 27790, 27885, 28170, 28190, 28200, 28400, 28440, 28450, 28700, 28705, 29005, 29173 |
| | | 30005, 30010, 30035, 30045, 30070, 30075, 30100, 30110, 30120, 30125, 30140, 30215, 30260, 30355, 30360, 30365 |
| | | 35005, 35065, 35100, 35600, 35760, 35850, 36020 |
| | | 40215, 40220, 40230, 40265, 40290 |
| | | 42780 |
| | | 50230 |
| | | See also Benzenesulfonic acid, <i>p</i> -(<i>p</i> -aminophenylazo)- |

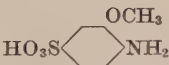
| | | |
|--|---------------------|-------|
| Sulfanilic acid, <i>N</i>-acetoacetyl- | $C_{10}H_{11}NO_5S$ | 25340 |
| $CH_3 \cdot CO \cdot CH_2 \cdot CO \cdot HN$  | Mol. wt. 257 | |

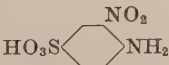
| | | |
|---|-----------------|--------------|
| Sulfanilic acid, 3-chloro- | $C_6H_6ClNO_3S$ | 14015 |
|  | Mol. wt. 207 | 20425, 28220 |
| | | 30190 |


| | | |
|---|-------------------|----------------------------|
| Sulfanilic acid, 2,5-dichloro- | $C_6H_5Cl_2NO_3S$ | 13150, 13480, 14020, 14190 |
|  | Mol. wt. 242 | 28280 |

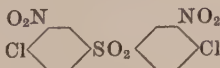
| | | |
|--|-------------------|-------|
| Sulfanilic acid, <i>N</i>-(2,4-dinitrophenyl)- | $C_{12}H_9N_3O_7$ | 53140 |
|  | Mol. wt. 307 | |

| | | |
|---|-----------------------|--------------|
| Sulfanilic acid, <i>N</i>-[<i>p</i>-(<i>p</i>-hydroxyanilino)phenyl]- | $C_{18}H_{16}N_2O_4S$ | 53470, 53471 |
|  | Mol. wt. 356 | |

| | | |
|---|---------------|-------|
| Sulfanilic acid, 3-methoxy- | $C_7H_9NO_4S$ | 14825 |
|  | Mol. wt. 203 | |

| | | |
|---|-----------------|--------------|
| Sulfanilic acid, 3-nitro- | $C_6H_6N_2O_5S$ | 10445 |
|  | Mol. wt. 218 | 15540, 16115 |

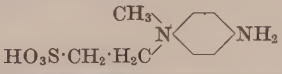
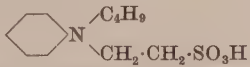
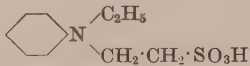
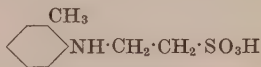
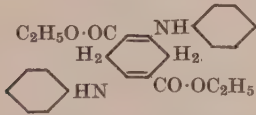

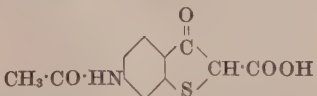
| | | |
|---|---------------------|-------|
| Sulfanilic acid, <i>N</i>-phenyl- | $C_{12}H_{11}NO_3S$ | 42780 |
|  | Mol. wt. 249 | |

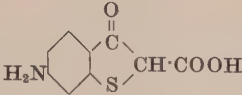
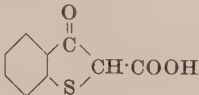
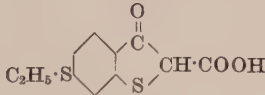
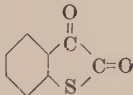
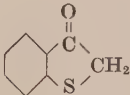
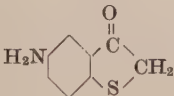
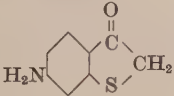
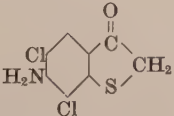
| | | |
|---|------------------------|-------|
| Sulfone, bis(4-chloro-3-nitrophenyl) | $C_{12}H_6Cl_2N_2O_6S$ | 10410 |
|  | Mol. wt. 377 | |

4-Sulfophthalic acid

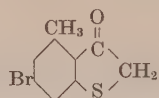
See Phthalic acid, 4-sulfo-

T

| | | |
|---|----------------------|---------------------|
| Taurine | $C_2H_7NO_3S$ | 44500 |
| $H_2N \cdot CH_2 \cdot CH_2 \cdot SO_3H$ | Mol. wt. 125 | |
| Decomposes at $\sim 240^\circ$ | | |
| Taurine, <i>N</i>-(<i>p</i>-aminophenyl)-<i>N</i>-methyl- | $C_9H_{14}N_2O_3S$ | 10380 20180 |
|  | Mol. wt. 230 | |
| Taurine, <i>N</i>-(4-amino-2-sulfohenyl)-<i>N</i>-methyl- | | |
| <i>See</i> Benzenesulfonic acid, 5-amino-2-[methyl(2-sulfoethyl)amino]- | | |
| Taurine, <i>N</i>-butyl-<i>N</i>-phenyl- | $C_{12}H_{19}NO_3S$ | 42675, 42680, 43515 |
|  | Mol. wt. 257 | |
| Taurine, <i>N</i>-ethyl-<i>N</i>-phenyl- | $C_{10}H_{15}NO_3S$ | 42610 |
|  | Mol. wt. 229 | |
| Taurine, <i>N</i>-<i>o</i>-tolyl- | $C_9H_{13}NO_3S$ | 42540, 43540 |
|  | Mol. wt. 215 | |
| Terephthalic acid, 2,5-dianilino-3,6-dihydro, diethyl ester | $C_{24}H_{26}N_2O_4$ | 46500 |
|  | | |
| Terephthaloyl chloride | $C_8H_4Cl_2O_2$ | 65425 70405 |
|  | Mol. wt. 203 | |
| | m.p. $83-84^\circ$ | |
| Terephthaloyldiacetic acid, diethyl ester | $C_{16}H_{18}O_6$ | |
| <i>See</i> Acetic acid, terephthaloyldi-, diethyl ester | | |
| Tetrachlorophthalic anhydride | | |
| <i>See</i> Phthalic anhydride, 3,4,5,6-tetrachloro- | | |
| 1,3,6,8-Tetrachloropyrene-5,10-quinone | | |
| <i>See</i> 1,6-Pyrenedione, 3,5,8,10-tetrachloro- | | |
| 2-Thianaphthenecarboxylic acid, 6-acetamido-2,3-dihydro-3-oxo- | $C_{11}H_9NO_4S$ | 73330 |
|  | Mol. wt. 251 | |

| | | |
|---|----------------------|--|
| 2-Thianaphthenecarboxylic acid, 6-amino-2,3-dihydro-3-oxo- | $C_9H_7NO_3S$ | 73330 |
|  | Mol. wt. 209 | |
| | m.p. 209° | |
| 2-Thianaphthenecarboxylic acid, 2,3-dihydro-3-oxo- | $C_9H_6O_3S$ | 73635, 73860 |
|  | Mol. wt. 194 | |
| 2-Thianaphthenecarboxylic acid, 2,3-dihydro-3-oxo- 6-(ethylmercapto)- | $C_{11}H_{10}O_3S_2$ | 73345 |
|  | Mol. wt. 222 | |
| Thianaphthenequinone | $C_8H_4O_2S$ | 73400, 73635 |
|  | Mol. wt. 164 | |
| 3(2H)-Thianaphthenone | C_8H_6OS | 73300, 73610, 73615, 73620, 73635, 73650, 73860, 73861 |
|  | Mol. wt. 150 | |
| | m.p. 71° | |
| 3(2H)-Thianaphthenone, 6-acetamido-2-carboxy- | | |
| <i>See 2-Thianaphthenecarboxylic acid, 6-acetamido-2,3-dihydro-3-oxo-</i> | | |
| 3(2H)-Thianaphthenone, 5-amino- | C_8H_7NOS | 73630 |
|  | Mol. wt. 165 | |
| | m.p. 165° | |
| 3(2H)-Thianaphthenone, 6-amino- | C_8H_7NOS | 73625, 73630, 73655, 73870 |
|  | Mol. wt. 165 | |
| | m.p. 165° | |
| 3(2H)-Thianaphthenone, 6-amino-2-carboxy- | | |
| <i>See 2-Thianaphthenecarboxylic acid, 6-amino-2,3-dihydro-3-oxo-</i> | | |
| 3(2H)-Thianaphthenone, 6-amino-5,7-dichloro- | $C_8H_5Cl_2NOS$ | 73640 |
|  | Mol. wt. 234 | |

3(2H)-Thianaphthenone, 6-bromo-4-methyl- C_9H_7BrOS 73375



Mol. wt. 243

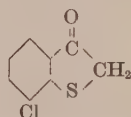
3(2H)-Thianaphthenone, 2-carboxy-

See 2-Thianaphthenecarboxylic acid, 2,3-dihydro-3-oxo-

3(2H)-Thianaphthenone, 2-carboxy-6-(ethylmercapto)-

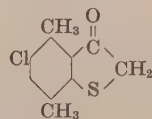
See 2-Thianaphthenecarboxylic acid,
6-(ethylmercapto)-2,3-dihydro-3-oxo-

3(2H)-Thianaphthenone, 7-chloro- C_8H_5ClOS 73310



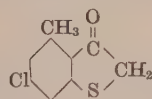
Mol. wt. 184.5

3(2H)-Thianaphthenone, 5-chloro-4,7-dimethyl- $C_{10}H_9ClOS$ 73395



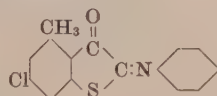
Mol. wt. 212.5

3(2H)-Thianaphthenone, 6-chloro-4-methyl- C_9H_7ClOS 73360, 73365, 73600



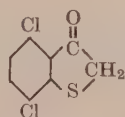
Mol. wt. 198.5

3(2H)-Thianaphthenone, 6-chloro-4-methyl-2-phenylimino- $C_{15}H_{10}ClNOS$ 73355



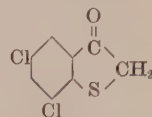
Mol. wt. 287.5

3(2H)-Thianaphthenone, 4,7-dichloro- $C_8H_4Cl_2OS$ 73312



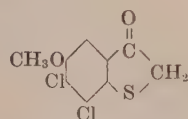
Mol. wt. 219

3(2H)-Thianaphthenone, 5,7-dichloro- $C_8H_4Cl_2OS$ 73675



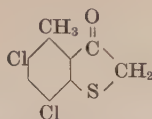
Mol. wt. 219

3(2H)-Thianaphthenone, 6,7-dichloro-5-methoxy- $C_9H_6Cl_2O_2S$ 73405



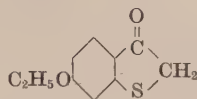
Mol. wt. 249

3(2H)-Thianaphthenone, 5,7-dichloro-4-methyl- $C_9H_6Cl_2OS$ 73365, 73605



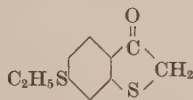
Mol. wt. 233

3(2H)-Thianaphthenone, 6-ethoxy- $C_{10}H_{10}O_2S$ 73335



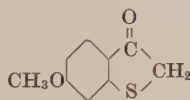
Mol. wt. 194

3(2H)-Thianaphthenone, 6-(ethylmercapto)- $C_{10}H_{10}OS_2$ 73345



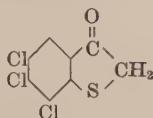
Mol. wt. 210

3(2H)-Thianaphthenone, 6-methoxy- $C_9H_8O_2S$ 73355



Mol. wt. 180

3(2H)-Thianaphthenone, 5,6,7-trichloro- $C_8H_3Cl_3OS$ 73595



Mol. wt. 253.5

Thiocarbanilide, 4,4'-diamino-

See Carbanilide, 4,4'-diaminothio-

p-Thiocresol

See p-Toluenethiol

Thioglycolic acid, (2-carboxyphenyl)-

See Benzoic acid, o-(carboxymethylmercapto)-

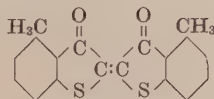
Thioglycolic acid, 2-naphthyl-

See Acetic acid, (2-naphthylmercapto)-

Thioglycolic acid, (o-nitrophenyl)-

See Acetic acid, (o-nitrophenylmercapto)-

Thioindigo, 4,4'-dimethyl- $C_{18}H_{12}O_2S_2$ 73375



Mol. wt. 324

Thioindoxyl

See 3(2H)-Thianaphthenone

Thioindoxyl, 5-amino-

See 3(2H)-Thianaphthenone, 5-amino-

Thioindoxyl, 6-amino-

See 3(2*H*)-Thianaphthenone, 6-amino-

Thioindoxyl, 6-amino-5,7-dichloro-

See 3(2*H*)-Thianaphthenone, 6-amino-5,7-dichloro-

Thioindoxyl, 6-bromo-4-methyl-

See 3(2*H*)-Thianaphthenone, 6-bromo-4-methyl-

Thioindoxyl, 7-chloro-

See 3(2*H*)-Thianaphthenone, 7-chloro-

Thioindoxyl, 5,7-dichloro-

See 3(2*H*)-Thianaphthenone, 5,7-chloro-

Thioindoxyl, 6,7-dichloro-5-methoxy-

See 3(2*H*)-Thianaphthenone, 6,7-dichloro-5-methoxy-

Thioindoxyl, 5,7-dichloro-4-methyl-

See 3(2*H*)-Thianaphthenone, 5,7-dichloro-4-methyl-

Thioindoxyl, 6-ethoxy-

See 3(2*H*)-Thianaphthenone, 6-ethoxy-

Thioindoxyl, 6-ethylmercapto-

See 3(2*H*)-Thianaphthenone, 6-(ethylmercapto)-

Thioindoxyl, 6-methoxy-

See 3(2*H*)-Thianaphthenone, 6-methoxy-

Thioindoxyl, 5,6,7-trichloro-

See 3(2*H*)-Thianaphthenone, 5,6,7-trichloro-

Thioindoxyl- α -anilide, 6-chloro-4-methyl-

See 3(2*H*)-Thianaphthenone, 6-chloro-4-methyl-2-phenylimino-

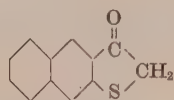
Thioisatin

See Thianaphthenequinone

3(2*H*)-Thiophanthrenone

$C_{12}H_8OS$

73415

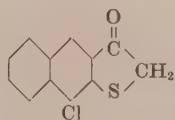


Mol. wt. 200

3(2*H*)-Thiophanthrenone, 9-chloro-

$C_{12}H_7ClOS$

73420



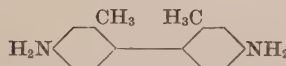
Mol. wt. 234.5

1-Thiophen, 4,5-benzo-3-hydroxy-

See Naphtho[2,1,*b*]thiophen-1(2*H*)-one

Thiophenol, 2,4-dichloro-*See* Benzenethiol, 2,4-dichloro-**Thiophenol, 2,5-dichloro-***See* Benzenethiol, 2,5-dichloro-**Thiophenol, 3,4-dichloro-***See* Benzenethiol, 3,4-dichloro-**Thiourea, 1-(3-amino-*p*-tolyl)-***See* Urea, 1-(3-amino-*p*-tolyl)-2-thio-**Thiourea, *sym*-diphenyl-***See* Carbanilide, thio-**Tobias acid***See* 1-Naphthalenesulfonic acid, 2-amino-***m*-Tolidine** $C_{14}H_{16}N_2$

23250, 23255, 23260, 23265, 23266, 23270, 23275, 23280, 23285, 23290, 23295, 23310



Mol. wt. 212

***o*-Tolidine** $C_{14}H_{16}N_2$

21130, 21135, 21150, 23350, 23360, 23365, 23370, 23375, 23380, 23385, 23390, 23400, 23500, 23505, 23510, 23515, 23520, 23530, 23540, 23550, 23560, 23565, 23570, 23580, 23585, 23590, 23595, 23600, 23605, 23610, 23620, 23625, 23630, 23635, 23640, 23645, 23650, 23655, 23660, 23665, 23675, 23680, 23685, 23690, 23695, 23700, 23705, 23710, 23715, 23720, 23730, 23740, 23745, 23750, 23760, 23770, 23780, 23785, 23790, 23795, 23810, 23820, 23825, 23830, 23835, 23840, 23850, 23860

30355, 30370, 30375, 30380, 30385, 30390, 31875, 31880, 31885, 31890, 31895, 31900, 31905, 31910, 31915, 31920, 31925, 31930, 31935

35100, 35225, 35230, 35540, 35670, 36220

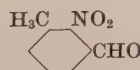
37230, 37570, 37610



Mol. wt. 212

3,3'-Tolidine-6,6'-disulfonic acid*See* 2,2'-Biphenyldisulfonic acid, 4,4'-diamino-5,5'-dimethyl-***m*-Tolualdehyde, 2-nitro-** $C_8H_7NO_3$

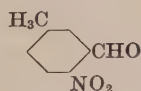
73090



Mol. wt. 165

***m*-Tolualdehyde, 6-nitro-** $C_8H_7NO_3$

73085

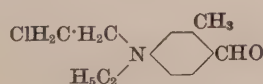


Mol. wt. 165

m.p. 64°

***o*-Tolualdehyde, 4-[(2-chloroethyl)ethylamino]-** $C_{12}H_{16}ClNO$

48020



Mol. wt. 225.5

Toluene, α -chloro-

C_7H_7Cl

42536, 45360



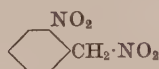
Mol. wt. 126.5

Oil, b.p. 179°

Toluene, o,α -dinitro-

$C_7H_5N_2O_4$

73005

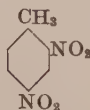


Mol. wt. 182

Toluene, 2,4-dinitro-

$C_7H_5N_2O_4$

53015, 53020, 53021, 53025, 53170, 53218



Mol. wt. 182

m.p. 70-71°

Toluene, nitro and dinitro (mixed)-

53170, 53218

Toluene, p -nitro-

$C_7H_7NO_2$

42036, 53170, 53218



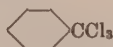
Mol. wt. 137

m.p. 51.4°
b.p. 238°

Toluene, α,α,α -trichloro-

$C_7H_5Cl_3$

42000, 42125, 44530



Mol. wt. 195.5

47040
67300, 67301

b.p. 213-214°

Toluene- $\alpha,4$ -diamine, N^α,N^α -diethyl-

$C_{11}H_{18}N_2$

12130



Mol. wt. 178

Toluene- $\alpha,4$ -diamine, N^α,N^α -dimethyl-

$C_9H_{14}N_2$

11930



Mol. wt. 150

Toluene-2,4-diamine

$C_7H_{10}N_2$

11320, 11325, 11330, 11335, 13320
20140, 21010, 24080, 25070



Mol. wt. 122

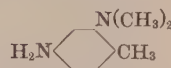
30010, 30020, 30100, 30105, 30110, 30115, 30120, 30125, 30245,
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35045, 35260, 35450, 35660, 35670, 35680
46020, 46025, 46040, 46065, 46080
50040
53050, 53051, 53055, 53056, 53060, 53065, 53066, 53070, 53075,
53080, 53085, 53090, 53091, 53095, 53100, 53105, 53115,
53130, 53135, 53175, 53295
76035, 76036

m.p. 99°
b.p. 280°

Toluene-2,4-diamine, N^2,N^2 -dimethyl-

$C_9H_{14}N_2$

46070

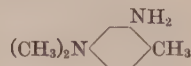


Mol. wt. 150

Toluene-2,4-diamine, N^4,N^4 -dimethyl-

$C_9H_{14}N_2$

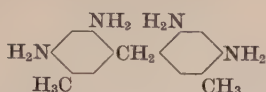
50045, 50265



Mol. wt. 150

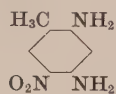
m.p. 54°

Toluene-2,4-diamine, 5,5'-methylenedi- $C_{15}H_{20}N_4$ 23390



Mol. wt. 256

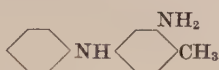
Toluene-2,4-diamine, 5-nitro- $C_7H_9N_3O_2$ 76040



Mol. wt. 167

m.p. 154°

Toluene-2,4-diamine, N⁴-phenyl- $C_{13}H_{14}N_2$ 50215, 50216



Mol. wt. 198

m.p. 76-77°

Toluene-2,5-diamine $C_7H_{10}N_2$ 10415

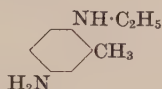


Mol. wt. 122

16620
50240, 50435
76042

m.p. 64-65°

Toluene-2,5-diamine, N²-ethyl- $C_9H_{14}N_2$ 50250, 50310

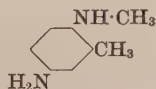


Mol. wt. 150

52030

Liquid, b.p. 274-275°
Hydrochloride
(+2HCl)
m.p. 124° (decomp.)

Toluene-2,5-diamine, N²-methyl- $C_8H_{12}N_2$ 50300



Mol. wt. 136

Toluene-2,6-diamine $C_7H_{10}N_2$ 21020

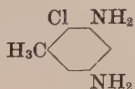


Mol. wt. 122

31570
53100

m.p. 105°

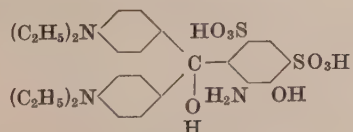
Toluene-3,5-diamine, 2-chloro- $C_7H_9ClN_2$ 76045



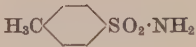
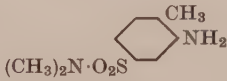
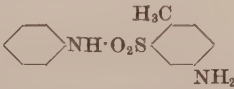
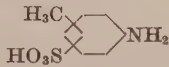

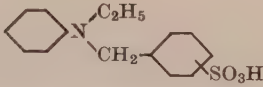
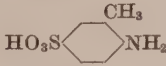
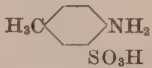
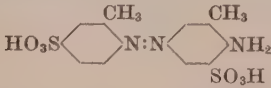
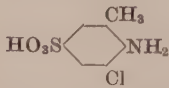
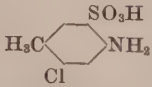
Mol. wt. 156.5

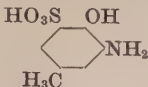
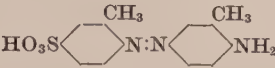
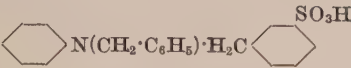
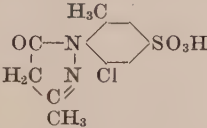
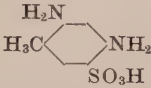
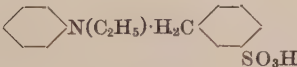
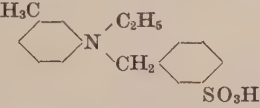
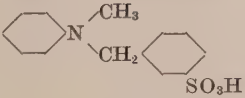
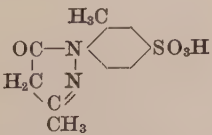
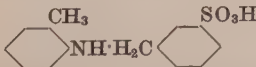
m.p. 73-74°

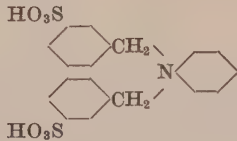
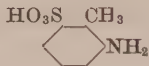
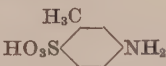
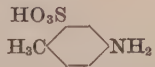
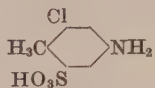
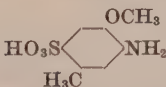
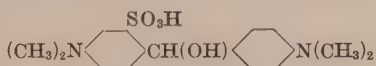
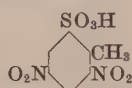
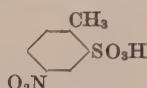


Toluene-2,4-disulfonic acid, 6-amino-α,α-bis(p-diethylaminophenyl)-α,5-dihydroxy- $C_{27}H_{35}N_3O_8S_2$ 18775


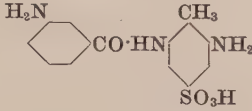
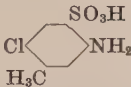
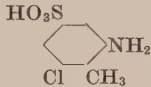
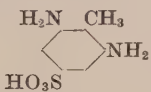
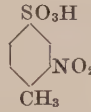
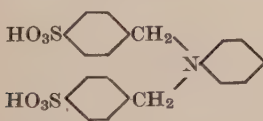

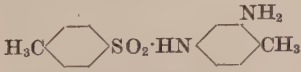



Mol. wt. 593

| | | |
|---|--|--|
| p-Toluenesulfonamide | $C_7H_9NO_2S$ | 62015, 67915 74160 |
|  | Mol. wt. 171 | |
| | m.p. 137.5° (+ 2H ₂ O) m.p. 105° | |
| p-Toluenesulfonamide, 3-amino-N,N-dimethyl- | $C_9H_{14}N_2O_2S$ | 37111 |
|  | Mol. wt. 214 | |
| o-Toluenesulfonanilide, 5-amino- | $C_{13}H_{14}N_2O_2S$ | 14690, 16015, 18835, 18970 |
|  | Mol. wt. 262 | |
| Toluenesulfonic acid, amino- | $C_7H_9NO_3S$ | 17900 27085 |
|  | Mol. wt. 187 | |
| Toluenesulfonic acid, aminohydroxy- | $C_7H_9NO_4S$ | 15700 |
|  | Mol. wt. 203 | |
| Toluenesulfonic acid, α-(N-ethylanilino)- | $C_{15}H_{17}NO_3S$ | 26207 |
|  | Mol. wt. 291 | |
| m-Toluenesulfonic acid, 4-amino- | $C_7H_9NO_3S$ | 13130, 14058, 14610, 15575, 16550, 18720 20260, 28180, 29175, 29185 34150 <i>See also dyes from</i> <i>m-Toluenesulfonic acid, 4-(4-amino-m-tolylazo)-</i> |
|  | Mol. wt. 187 | |
| m-Toluenesulfonic acid, 6-amino- | $C_7H_9NO_3S$ | 13235, 14685, 15850, 18205, 19570 27850, 27900, 28140 |
|  | Mol. wt. 187 | |
| m-Toluenesulfonic acid, 2-amino-4',5'-azodi- | $C_{14}H_{15}N_3O_6S_2$ | 13135 |
|  | Mol. wt. 385 | |
| m-Toluenesulfonic acid, 4-amino-5-chloro- | $C_7H_8ClNO_3S$ | 19185 26350, 28165, 28480 |
|  | Mol. wt. 221.5 | |
| m-Toluenesulfonic acid, 6-amino-4-chloro- | $C_7H_8ClNO_3S$ | 15590, 15865 |
|  | Mol. wt. 221.5 | |

| | | |
|--|-------------------------|--|
| <i>m</i>-Toluenesulfonic acid, 5-amino-6-hydroxy- | $C_7H_9NO_4S$ | 18750 |
|  | Mol. wt. 205 | |
| <i>m</i>-Toluenesulfonic acid, 4-(4-amino-<i>m</i>-tolylazo)- | $C_{14}H_{15}N_3O_3S$ | 26670, 26910, 27020, 27165, 28175, 28215, 28240 34255 |
|  | Mol. wt. 305 | |
| <i>m</i>-Toluenesulfonic acid, α-(<i>N</i>-benzylanilino)- | $C_{20}H_{19}NO_3S$ | 42575, 42576 |
|  | Mol. wt. 353 | |
| <i>m</i>-Toluenesulfonic acid, 5-chloro-4-(3-methyl-5-oxo-2-pyrazolin-1-yl)- | $C_{11}H_{11}ClN_2O_4S$ | 19020, 19025, 19030, 19035, 19040 24825 |
|  | Mol. wt. 302.5 | |
| <i>m</i>-Toluenesulfonic acid, 4,6-diamino- | $C_7H_{10}N_2O_3S$ | 22080, 23370, 23375, 23380, 23385 30035, 30040, 31720 |
|  | Mol. wt. 202 | |
| <i>m</i>-Toluenesulfonic acid, α-(<i>N</i>-ethylanilino)- | $C_{15}H_{17}NO_3S$ | 13155, 13160, 13165, 13170 26210 |
|  | Mol. wt. 291 | 42085, 42090, 42100, 42110, 42115, 42145, 42570, 42640, 42645, 42650, 42660, 42665, 42666 |
| | | 50230 52035 |
| <i>m</i>-Toluenesulfonic acid, α-(<i>N</i>-ethyl-<i>m</i>-toluidino)- | $C_{16}H_{19}NO_3S$ | 13175, 13180, 13185 42145, 42160, 42165, 42170, 42562, 42735, 42740 |
|  | Mol. wt. 305 | |
| <i>m</i>-Toluenesulfonic acid, α-(<i>N</i>-methylanilino)- | $C_{14}H_{15}NO_3S$ | 13145 42070, 42075, 42560, 42615, 42620, 42725 |
|  | Mol. wt. 277 | |
| <i>m</i>-Toluenesulfonic acid, 4-(3-methyl-5-oxo-2-pyrazolin-1-yl)- | $C_{11}H_{12}N_2O_4S$ | 19010 23275 |
|  | Mol. wt. 268 | |
| <i>m</i>-Toluenesulfonic acid, α-<i>o</i>-toluidino- | $C_{14}H_{15}NO_3S$ | 42720, 42725 |
|  | Mol. wt. 277 | |

| | | |
|--|-----------------------|---|
| <i>m</i>-Toluenesulfonic acid, α,α'-(phenylimino)di- | $C_{20}H_{19}NO_6S_2$ | 42580 |
|  | Mol. wt. 433 | |
| <i>o</i>-Toluenesulfonic acid, 3-amino- | $C_7H_9NO_3S$ | 15570 |
|  | Mol. wt. 187 | |
| <i>o</i>-Toluenesulfonic acid, 4-amino- | $C_7H_9NO_3S$ | 15580 |
|  | Mol. wt. 187 | |
| <i>o</i>-Toluenesulfonic acid, 5-amino- | $C_7H_9NO_3S$ | 13110, 15851 26365 60735, 61575 |
|  | Mol. wt. 187 | |
| <i>o</i>-Toluenesulfonic acid, 5-amino-3-chloro- | $C_7H_8ClNO_3S$ | 20185 |
|  | Mol. wt. 221.5 | |
| <i>o</i>-Toluenesulfonic acid, 4-amino-5-methoxy- | $C_8H_{11}NO_4S$ | 15870 |
|  | Mol. wt. 217 | |
| <i>o</i>-Toluenesulfonic acid, 5-dimethylamino-α- (<i>p</i>-dimethylaminophenyl)-α-hydroxy- | $C_{17}H_{22}N_2O_4S$ | 42576 |
|  | Mol. wt. 350 | |
| <i>o</i>-Toluenesulfonic acid, 3,5-dinitro- | $C_7H_6N_2O_7S$ | 53030 |
|  | Mol. wt. 262 | |
| <i>o</i>-Toluenesulfonic acid, 5-nitro- | $C_7H_7NO_6S$ | 40000, 40015, 40025, 40030, 40065, 40066, 40070, 40500, 40505, 40510 |
|  | Mol. wt. 217 | See also dyes from 2,2'-Stilbenedisulfonic acid, 4,4'-dinitro- |
| <i>p</i>-Toluenesulfonic acid, 2-butoxyethyl ester | $C_{13}H_{20}O_4S$ | 59840 |
|  | Mol. wt. 272 | |
| <i>p</i>-Toluenesulfonic acid, 2-chloroethyl ester | $C_9H_{11}ClO_3S$ | 71200, 71205 |
|  | Mol. wt. 234.5 | |
| | b.p. 210°/21 mm. | |

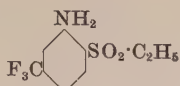
| | | |
|---|-----------------------|--|
| <i>p</i>-Toluenesulfonic acid, methyl ester | $C_8H_{10}O_3S$ | 46000 |
|  | Mol. wt. 186 | |
| | m.p. 28° | |
| <i>p</i>-Toluenesulfonic acid, 3-amino-5-(<i>m</i>-aminobenzamido)- | $C_{14}H_{15}N_3O_4S$ | 29090 |
|  | Mol. wt. 321 | |
| <i>p</i>-Toluenesulfonic acid, 2-amino-5-chloro- | $C_7H_8ClNO_3S$ | 15585, 15860 |
|  | Mol. wt. 221.5 | |
| <i>p</i>-Toluenesulfonic acid, 3-amino-5-chloro- | $C_7H_8ClNO_3S$ | 14615 20185 33530 |
|  | Mol. wt. 221.5 | |
| <i>p</i>-Toluenesulfonic acid, 3,5-diamino- | $C_7H_{10}N_2O_3S$ | 21500, 21505, 21510, 21515, 29250, 29255, 29260 30030, 30130, 31505 35040, 35045, 35070, 35200, 35205, 35400, 36010, 36310, 36311, 36320 |
|  | Mol. wt. 202 | |
| <i>p</i>-Toluenesulfonic acid, 3-nitro- | $C_7H_7NO_5S$ | 53070 |
|  | Mol. wt. 217 | |
| | m.p. 92° | |
| <i>p</i>-Toluenesulfonic acid, α,α'-(phenylimino)di- | $C_{20}H_{19}NO_6S_2$ | 42581 |
|  | Mol. wt. 433 | |
| α-Toluenesulfonic acid, <i>p</i>-amino- | $C_7H_9NO_3S$ | 17100, 17550 |
|  | Mol. wt. 187 | |
| <i>p</i>-Toluenesulfono-<i>p</i>-toluidide, 3'-amino- | $C_{14}H_{16}N_2O_2S$ | 11170 |
|  | Mol. wt. 276 | |
| <i>p</i>-Toluenethiol | C_7H_8S | 62575 |
|  | Mol. wt. 124 | |
| | m.p. 43-44° | |

| | | | |
|--|--|--------------------|---|
| o-Toluic acid | <chem>Cc1ccccc1C(=O)O</chem> | $C_8H_8O_2$ | 42010 |
| | | Mol. wt. 136 | |
| | | m.p. 103.7° | |
| | | b.p. 259.2° | |
| o-Toluic acid, α-(4-amino-<i>m</i>-tolyl)-, ethyl ester | <chem>CCOC(=O)Cc1ccc(N)cc1C</chem> | $C_{17}H_{19}NO_2$ | 62155 |
| | | Mol. wt. 269 | |
| p-Toluic acid | <chem>Cc1ccc(cc1)C(=O)O</chem> | $C_8H_8O_2$ | 42015 |
| | | Mol. wt. 136 | |
| | | m.p. 180° | |
| | | b.p. 274-275° | |
| p-Toluic acid, 5-amino-2-benzoyl- | <chem>O=C(c1ccccc1)C2=CC=C(N)C(=C2)C(=O)O</chem> | $C_{15}H_{13}NO_3$ | 69540 |
| | | Mol. wt. 255 | |
| m-Toluidine | <chem>Cc1cccc(N)c1</chem> | C_7H_9N | 13190, 16011, 18000, 18001 20450, 24060, 26060, 26115, 26140, 27005, 27010, 27600, 28105, 28180, 28220, 28250, 28255, 28340, 28370, 28375, 28720, 29020, 29025 |
| | | Mol. wt. 107 | 33500, 33530, 34015, 34285, 34300 |
| | | b.p. 203.3 | 35785, 35800, 35850, 36200 42800 61520, 61700, 68300 |
| m-Toluidine, N-benzyl-N-ethyl- | <chem>CCN(Cc1ccccc1)Cc2ccccc2</chem> | $C_{16}H_{19}N$ | 42634, 42635, 42655, 42715, 42740 |
| | | Mol. wt. 225 | |
| m-Toluidine, 6-chloro-α,α,α-trifluoro- | <chem>ClC1=CC=C(N)C(F)(F)F=C1</chem> | $C_7H_5ClF_3N$ | 37050 |
| | | Mol. wt. 195.5 | |
| m-Toluidine, N,N-diethyl- | <chem>CCN(CC)Cc1ccccc1C</chem> | $C_{11}H_{17}N$ | 42645 |
| | | Mol. wt. 163 | |
| | | b.p. 231-231.5° | |
| m-Toluidine, N,N-diethyl-4-nitroso- | <chem>CCN(CC)Cc1ccc([N+](=O)[O-])cc1C</chem> | $C_{11}H_{16}N_2O$ | 51170 |
| | | Mol. wt. 192 | |
| m-Toluidine, N,N-dimethyl- | <chem>CN(C)Cc1ccccc1C</chem> | $C_9H_{13}N$ | 42557 |
| | | Mol. wt. 135 | |

***m*-Toluidine, 6-(ethylsulfonyl)- α,α,α -trifluoro-**

$C_9H_{10}F_3NO_2S$

37065



Mol. wt. 253

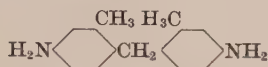
***m*-Toluidine, 6-methoxy-4-nitro-**

See *o*-Anisidine, 5-methyl-4-nitro-

***m*-Toluidine, 4,4'-methylenedi-**

$C_{16}H_{18}N_2$

24760, 24765



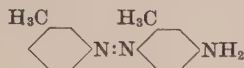
Mol. wt. 226

***m*-Toluidine, 4-*m*-tolylazo-**

$C_{14}H_{15}N_3$

26110

50045



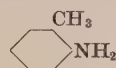
Mol. wt. 225

m.p. 100°

***o*-Toluidine**

C_7H_9N

11160, 11280, 11325, 11390, 11860, 12005, 12100, 12720, 12820, 14810, 16010, 16011, 16047, 16140, 17870, 18129, 19500, 19565, 19590, 19610



Mol. wt. 107

20530, 22020, 26120, 26350, 26725, 27300, 27660, 28170, 29173, 29175, 29180, 29200, 29250, 29255

31695, 34015

37077, 37520, 37585

For other azo dyes derived from *o*-Toluidine see also *o*-Toluidine, 4-(*o*-tolylazo)- and *m*-Toluenesulfonic acid, 4-(4-amino-*m*-tolylazo)-

42510, 42520, 42795, 45190

50210, 50235, 50240, 50245, 50425, 52040, 52100

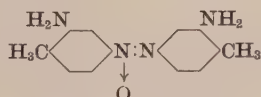
53037, 53045

73090, 73360

***o*-Toluidine, 5,5'-azoxydi-**

$C_{14}H_{16}N_4O$

25015, 25020

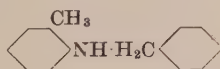


Mol. wt. 272

***o*-Toluidine, *N*-benzyl-**

$C_{14}H_{15}N$

42150, 42155, 42710



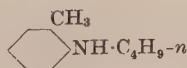
Mol. wt. 197

m.p. 56° (crystallised from ethanol);
60° (crystallised from ether)

***o*-Toluidine, *N*-butyl-**

$C_{11}H_{17}N$

42136

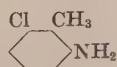


Mol. wt. 163

***o*-Toluidine, 3-chloro-**

C_7H_8ClN

37080



Mol. wt. 141.5

***o*-Toluidine, 4-chloro-**

C_7H_8ClN

11765, 12420, 12800

37085, 37525



Mol. wt. 141.5

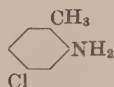
o-Toluidine, 5-chloro-

C_7H_8ClN

12430

20045

37090, 37526

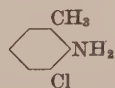


Mol. wt. 141.5

o-Toluidine, 6-chloro-

C_7H_8ClN

19230

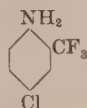


Mol. wt. 141.5

o-Toluidine, 4-chloro- α,α,α -trifluoro-

$C_7H_5ClF_3N$

37055

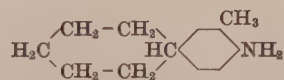


Mol. wt. 195.5

o-Toluidine, 4-cyclohexyl-

$C_{13}H_{19}N$

18130

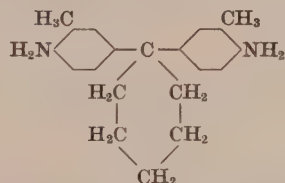


Mol. wt. 189

o-Toluidine, 4,4'-cyclohexyldenedi-

$C_{20}H_{25}N_2$

21230, 24800

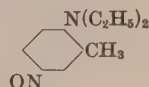


Mol. wt. 294

o-Toluidine, *N,N*-diethyl-4-nitroso-

$C_{11}H_{16}N_2O$

50310



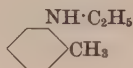
Mol. wt. 192

o-Toluidine, *N*-ethyl-

$C_9H_{13}N$

42130, 42135, 42140, 42666, 42725, 43535

52030



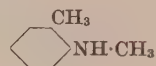
Mol. wt. 135

b.p. 214–214.5°

o-Toluidine, *N*-methyl-

$C_8H_{11}N$

50055, 50250



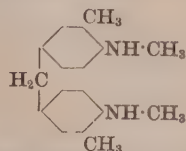
Mol. wt. 121

Oil, b.p. 207–208°

o-Toluidine, 4,4'-methylenebis[*N*-methyl-

$C_{17}H_{22}N_2$

41005



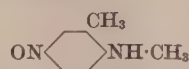
Mol. wt. 254

m.p. 86–87°
b.p. 255°/9 mm.

o-Toluidine, *N*-methyl-4-nitroso-

$C_8H_{10}N_2O$

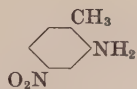
50215, 50250, 50300, 51165



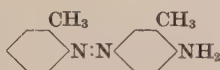
Mol. wt. 150

o-Toluidine, 4-nitro-

$C_7H_8N_2O_2$ 12385, 17165
35275
Mol. wt. 152 37100

o-Toluidine, 5-nitro-

$C_7H_8N_2O_2$ 12105, 12315, 12351, 12335, 12390, 12431
20500, 25015
Mol. wt. 152 30390
37105

o-Toluidine, 4-o-tolylazo-

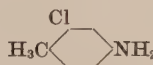
$C_{14}H_{15}N_3$ 13130, 13135
26075, 26105, 26420, 26430, 26665, 26765, 26766, 26785
Mol. wt. 225 27015, 27200
50045
m.p. 100°

p-Toluidine

C_7H_9N 16011, 18830, 19075
28135, 28310, 28320
Mol. wt. 107 37521
42500, 42510, 43550, 45186, 46050, 49000
50210, 50245, 50430, 56205
m.p. 45°
b.p. 200.4° 60725, 60885, 61525, 61530, 61565, 61570, 61705, 61710, 61800,
62080, 62085, 62090, 62095, 62100, 62105, 62110, 62535,
62545, 62550, 62555, 62560, 62565, 62570, 62575, 63335,
63340, 64510, 64515, 68210, 68215

p-Toluidine, o-amino-N,N-dimethyl-

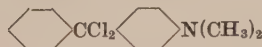
See Toluene-2,4-diamine, N^4N^4 -dimethyl-

p-Toluidine, 3-chloro-

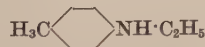
C_7H_8ClN 19080
Mol. wt. 141

p-Toluidine, dehydrothio-

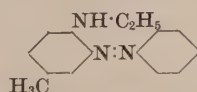
See Benzothiazole, 2-(p-aminophenyl)-6-methyl-

p-Toluidine, α,α-dichloro-N,N-dimethyl-α-phenyl-

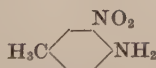
$C_{15}H_{16}Cl_2N$ 44000
Mol. wt. 280
m.p. 92°

p-Toluidine, N-ethyl-

$C_9H_{13}N$ 50080
Mol. wt. 135
Liquid, b.p. 217°

p-Toluidine, N-ethyl-2-phenylazo-

$C_{15}H_{17}N_3$ 50080
Mol. wt. 239

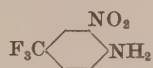
p-Toluidine, 2-nitro-

$C_7H_8N_2O_2$ 11680, 11720, 11735, 11945, 12120, 12350, 12395, 12690, 12730,
14060
Mol. wt. 152 37110

***p*-Toluidine, α,α,α -trifluoro-2-nitro-**

$C_7H_5F_3N_2O_2$

12125



Mol. wt. 206

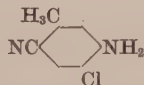
***p*-Toluidine sulfonic acid, dehydrothio-**

See 7-Benzothiazolesulfonic acid, 2-(*p*-aminophenyl)-6-methyl-

***o*-Tolunitrile, 4-amino-5-chloro-**

$C_8H_7ClN_2$

37095

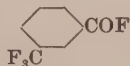


Mol. wt. 166.5

***m*-Toluoyl fluoride, α,α,α -trifluoro-**

$C_8H_4F_4O$

61735, 61736, 63360, 67110



Mol. wt. 192

***p*-Toluquinaldine**

$C_{11}H_{11}N$

47000



Mol. wt. 157

***p*-Toluquinone**

$C_7H_4O_2$

10415



Mol. wt. 122

m.p. 67°
b.p. sublimes

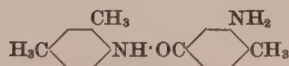
Tolusafranine, *N,N*-diethyl-

See Phenazinium chloride,
3-amino-7-diethylamino-2-methyl-

***p*-Tolu-2,4-xylydide, 3-amino-**

$C_{10}H_{13}N_2O$

12330



Mol. wt. 254

***m*-Tolylamine, 4,4'-diaminodi-**

See Di-*m*-tolylamine, 4,4'-diamino-

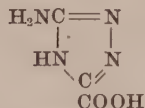
***N,N'*-2,4-Tolylenebisformamide**

See Formamide, *N,N'*-2,4-tolylenebis-

1,2,4,4*H*-Triazole-3-carboxylic acid, 5-amino-

$C_3H_4O_4N_2$

35110



Mol. wt. 132

**1,2-Triazoloanthraquinone,
3-bromo-1-*p*-tolyl-**

See 1*H*-Anthra[1,2]triazole-6,11-dione, 4-bromo-1-*p*-tolyl-

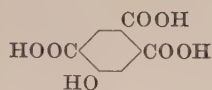
***m*-Trifluoromethylbenzoyl fluoride**

See *m*-Toluoyl fluoride, α,α,α -trifluoro-

Trimellitic acid, 5-hydroxy-

$C_8H_6O_7$

45180, 45390



Mol. wt. 226

m.p. 240–245°

2,4-Triphenylcarbinoldisulfonic acid,
6-amino-4',4''-bis(diethylamino)-5-hydroxy-

See Toluene-2,4-disulfonic acid,
6-amino- α,α -bis(*p*-diethylaminophenyl)- $\alpha,5$ -dihydroxy-

Triphenylmethane,
4,4'-*N,N'*-tetramethyldiamino-3''-amino-

See Aniline, *N,N',N'',N'''*-tetramethyl-
3,4,4''-methylidynetri-

U

Uramil

See Barbituric acid, 5-amino-

Urea

CH_4N_2O

65435, 68500



74160

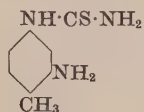
Mol. wt. 60

m.p. 132°

Urea, 1-(3-amino-*p*-tolyl)-2-thio-

$C_8H_{11}N_3S$

53125



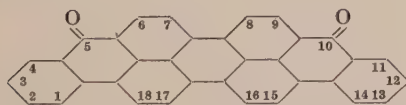
Mol. wt. 181

V

Violanthrone

$C_{34}H_{16}O_2$

59805, 59810, 59815, 59820, 59825, 59826, 59830, 59831, 59835,
59836, 59840, 59845, 59850, 59855, 59856



Mol. wt. 456

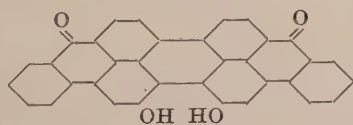
65230

71210

Violanthrone, 16,17-dihydroxy-

$C_{34}H_{16}O_4$

59825, 59826, 59830, 59831, 59835, 59836, 59840, 59845
71200, 71205

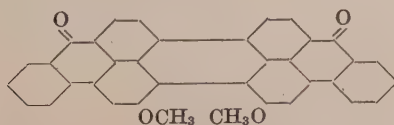


Mol. wt. 488

Violanthrone, 16,17-dimethoxy-

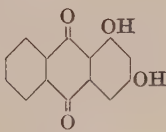
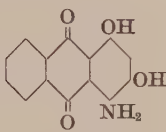
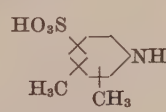
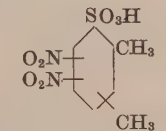
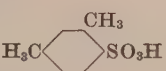
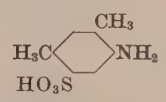
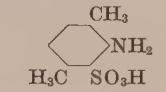
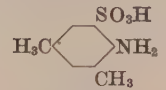
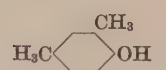
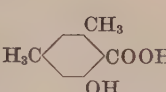
$C_{36}H_{20}O_4$


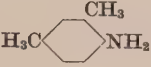
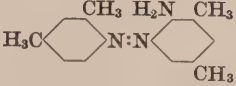
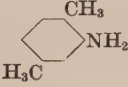
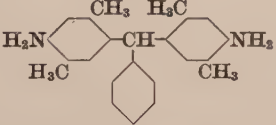
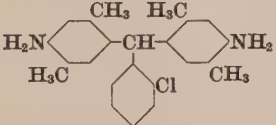
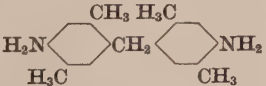
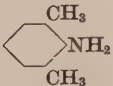
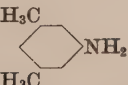
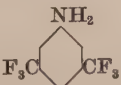
59830, 59831



Mol. wt. 516

X

| | | |
|---|-------------------------------|---|
| Xanthopurpurin | $C_{14}H_8O_4$ | 58205 |
|  | Mol. wt. 240 m.p. 268–270° | |
| Xanthopurpurin, 4-amino- | $C_{14}H_9NO_4$ | 60755 |
|  | Mol. wt. 255 | |
| Xylenesulfonic acid, amino- | $C_8H_{11}NO_3S$ | 15600 20305 |
|  | Mol. wt. 201 | |
| Xylenesulfonic acid, dinitro- | $C_8H_8N_2O_7S$ | 53035 |
|  | Mol. wt. 276 | |
| 2,4-Xylenesulfonic acid | $C_8H_{10}O_3S$ | 42055 |
|  | Mol. wt. 186 | |
| 2,4-Xylenesulfonic acid, 5-amino- | $C_8H_{11}NO_3S$ | 14700 27625 |
|  | Mol. wt. 201 | |
| 2,5-Xylenesulfonic acid, 6-amino- | $C_8H_{11}NO_3S$ | 26915 |
|  | Mol. wt. 201 | |
| 3,5-Xylenesulfonic acid, 2-amino- | $C_8H_{11}NO_3S$ | 14700, 14815, 17925, 19150 26915, 27855, 27905, 27980, 28270 |
|  | Mol. wt. 201 | |
| 2,4-Xylenol | $C_8H_{10}O$ | 11890 |
|  | Mol. wt. 122 | |
| 2,4-Xylic acid, 6-hydroxy- | $C_9H_{10}O_3$ | 43870 |
|  | Mol. wt. 166 | |

| | | | |
|--|---|---|--|
| Xylidine (mixed) |  | $C_8H_{11}N$ Mol. wt. 121 | 14820, 15010, 16020, 16152, 17815 20170 |
| 2,4-Xylidine |  | $C_8H_{11}N$ Mol. wt. 121 b.p. 215.8–216° | 12140, 12740, 14695, 14900, 16150, 16151, 17785, 19575 20020, 26735, 27025, 28325, 29105 50260 56200, 57527 |
| 2,4-Xylidine, 6-(2,4-xylidazo)- |  | $C_{16}H_{19}N_3$ Mol. wt. 253 | 26125, 27210 |
| 2,5-Xylidine |  | $C_8H_{11}N$ Mol. wt. 121 m.p. 15.5° b.p. 215°/739 mm. | 11240 26120, 26575, 26770, 27025, 27760, 27850, 27855, 27860, 27865, 28110, 28400, 28415, 28490, 28725, 29030 31780, 31795, 31840, 34005 50260 |
| p-Xylidine <i>See 2,5-Xylidine</i> | | | |
| 2,5-Xylidine, 4,4'-benzylidenedi- |  | $C_{23}H_{26}N_2$ Mol. wt. 330 | 21240, 24830 |
| 2,5-Xylidine, 4,4'-(o-chlorobenzylidene)di- |  | $C_{23}H_{25}ClN_2$ Mol. wt. 364.5 | 21250 |
| 2,5-Xylidine, 4,4'-methylenedi- |  | $C_{17}H_{22}N_2$ Mol. wt. 254 | 24770 |
| 2,6-Xylidine |  | $C_8H_{11}N$ Mol. wt. 121 b.p. 216° | 16149 28260 42525 45195 |
| 3,5-Xylidine |  | $C_8H_{11}N$ Mol. wt. 121 | 34270 |
| 3,5-Xylidine, α,α,α',α',α'-hexafluoro- |  | $C_8H_5F_6N$ Mol. wt. 229 | 37045 |

NOTES

INDEX TO ELEMENTARY FORMULAE

In this index the name first given for any compound conforms to the *Chemical Abstracts* system of nomenclature. Alternative systematic names or trivial names follow and are indented.

H₄N₂
Hydrazine

CCl₂O
Phosgene

CCl₄
Carbon tetrachloride

CH₂O
Formaldehyde

CH₂O₂
Formic acid

CH₃Cl
Methane, chloro-
Methyl chloride

CH₃I
Methane, iodo-
Methyl iodide

CH₄N₂O
Urea

CH₅N
Methylamine

C₂Cl₂O₂
Oxalyl chloride

C₂HCl₃O
Chloral

C₂H₂O₂
Glyoxal

C₂H₂O₄
Oxalic acid

C₂H₃ClO₂
Acetic acid, chloro-

C₂H₄Br₂
Ethane, 1,2-dibromo-
Ethylene dibromide

C₂H₄N₄
Guanidine, cyano-

C₂H₄O
Acetaldehyde

C₂H₄O₂S
Acetic acid, mercapto-

C₂H₅Br
Ethane, bromo-
Ethyl bromide

C₂H₅Cl
Ethane, chloro-
Ethyl chloride

C₂H₅ClO
Ethanol, 2-chloro-
Ethylene chlorohydrin

C₂H₅I
Ethane, iodo-
Ethyl iodide

C₂H₇N
Dimethylamine
Ethylamine

C₂H₇NO
Ethanol, 2-amino-
Ethanolamine

C₂H₇NO₃S
Taurine
Ethanesulfonic acid, 2-amino-

C₃Cl₃N₃
Cyanuric chloride

C₃H₄N₄O₂
1,2,4,4*H*-Triazole-3-carboxylic acid, 5-amino-

C₃H₅ClO
Epichlorohydrin

C₃H₆O
Acetone

C₃H₆O₂
2-Propanone, hydroxy-
Acetol
Methylketol

C₃H₈O₃
Glycerol

C₃H₉N
Isopropylamine

C₄H₄O₃
Succinic anhydride

C₄Cl₄N₂
Pyrimidine, 2,4,5,6-tetrachloro-

C₄H₆N₂O
5-Pyrazolone, 3-methyl-

C₄H₆O₃
Acetic anhydride

C₄H₆O₄
Succinic acid

C₄H₇ClO
Butyryl chloride

C₄H₁₀O₃
Orthoformic acid, trimethyl ester

C₄H₁₁N
Diethylamine

C₄H₁₁NO₂
Ethanol, 2-(2-aminoethoxy)-
Diglycolamine
Ethanol, 2,2'-iminodi-
Diethanolamine

C₅H₅N
Pyridine

$C_5H_7NO_2$
Acetic acid, cyano-, ethyl ester

$C_5H_8O_2$
2,4-Pentanedione
Acetone, acetyl-

$C_5H_{13}N$
Amylamine

$C_6Cl_4O_2$
Chloranil

$C_6H_2ClN_3O_6$
Picryl chloride
Benzene, 1-chloro-2,4,6-trinitro-

$C_6H_3ClN_2O_4$
Benzene, 1-chloro-2,4-dinitro-

$C_6H_3ClN_2O_7S$
Benzenesulfonic acid, 2-chloro-3,5-dinitro-
Benzenesulfonic acid, 4-chloro-3,5-dinitro-

$C_6H_3Cl_2NO_2$
Benzene, 1,4-dichloro-2-nitro-

$C_6H_3Cl_2NO_4S$
Benzenesulfonyl chloride, 4-chloro-3-nitro-

$C_6H_3Cl_4NO$
Phenol, 2-amino-3,4,5,6-tetrachloro-

$C_6H_3N_3O_7$
Picric acid

$C_6H_4BrN_3O_4$
Aniline, 2-bromo-4,6-dinitro-

$C_6H_4ClNO_2$
Benzene, 1-chloro-2-nitro-

$C_6H_4ClNO_5S$
Benzenesulfonic acid, 2-chloro-5-nitro-
Benzenesulfonic acid, 4-chloro-3-nitro-

$C_6H_4Cl_2$
Benzene, *o*-dichloro-

$C_6H_4Cl_2N_2O_2$
Aniline, 2,6-dichloro-4-nitro-

$C_6H_4Cl_2S$
Benzenethiol, 2,4-dichloro-
Phenylmercaptan, 2,4-dichloro-
Benzenethiol, 2,5-dichloro-
Phenylmercaptan, 2,5-dichloro-
Benzenethiol, 3,4-dichloro-
Phenylmercaptan, 3,4-dichloro-

$C_6H_4Cl_3N$
Aniline, 2,4,5-trichloro-

$C_6H_4Cl_3NO$
Phenol, 2-amino-3,4,6-trichloro-

$C_6H_4N_2O_4$
Benzene, *m*-dinitro-

$C_6H_4N_2O_5$
Phenol, 2,4-dinitro-

$C_6H_4O_2$
p-Quinone
p-Benzoquinone

$C_6H_5ClN_2O_2$
Aniline, 2-chloro-4-nitro-
Aniline, 4-chloro-2-nitro-
Aniline, 5-chloro-2-nitro-

$C_6H_5ClN_2O_3$
Phenol, 2-amino-4-chloro-5-nitro-
Phenol, 2-amino-4-chloro-6-nitro-
Phenol, 2-amino-6-chloro-4-nitro-

$C_6H_5ClN_2O_5S$
Benzenesulfonic acid, 2-amino-3-chloro-5-nitro-

C_6H_5ClO
Phenol, *p*-chloro-

$C_6H_5ClO_2$
Resorcinol, 2-chloro-
Resorcinol, 4-chloro-

C_6H_5ClS
Benzenethiol, *p*-chloro-
Phenylmercaptan, *p*-chloro-

$C_6H_5Cl_2N$
Aniline, 2,4-dichloro-
Aniline, 2,5-dichloro-
Aniline, 3,4-dichloro-

$C_6H_5Cl_2NO$
Phenol, 2-amino-4,6-dichloro-

$C_6H_5Cl_2NO_3S$
Benzenesulfonic acid, 2-amino-3,5-dichloro-
Benzenesulfonic acid, 2-amino-4,5-dichloro-
Metanilic acid, 4,5-dichloro-
Sulfanilic acid, 2,5-dichloro-

$C_6H_5Cl_2NO_4S$
1-Phenol-4-sulfonic acid, 2-amino-3,6-dichloro-

$C_6H_5NO_2$
Benzene, nitro-
Phenol, *p*-nitroso-

$C_6H_5NO_3$
Phenol, *p*-nitro-
Resorcinol, 4-nitroso-

$C_6H_5NO_6S$
1-Phenol-4-sulfonic acid, 2-nitro-

$C_6H_5N_3O_4$
Aniline, 2,4-dinitro-

$C_6H_5N_3O_5$
Picramic acid

$C_6H_5N_3O_7S$
Benzenesulfonic acid, 2-amino-3,5-dinitro-

C_6H_6ClN
Aniline, *m*-chloro-
Aniline, *o*-chloro-
Aniline, *p*-chloro-

C_6H_6ClNO
Phenol, 2-amino-4-chloro-
Phenol, 5-amino-2-chloro-

$C_6H_6ClNO_3S$
Benzenesulfonic acid, 2-amino-4-chloro-
Benzenesulfonic acid, 2-amino-5-chloro-
Metanilic acid, 4-chloro-
Metanilic acid, 6-chloro-
Sulfanilic acid, 3-chloro-

$C_6H_6ClNO_4S$
1-Phenol-2-sulfonic acid, 6-amino-4-chloro-
1-Phenol-4-sulfonic acid, 2-amino-6-chloro-

$C_6H_6Cl_2N_2$
p-Phenylenediamine, 2,6-dichloro-

$C_6H_6N_2O_2$
Aniline, *m*-nitro-
Aniline, *o*-nitro-
Aniline, *p*-nitro-

| | |
|--|---|
| C₆H₆N₂O₃ Phenol, 2-amino-4-nitro- Phenol, 2-amino-5-nitro- Phenol, 4-amino-2-nitro- | C₆H₇NS Benzenethiol, <i>o</i> -amino- Thiophenol, <i>o</i> -amino- |
| C₆H₆N₂O₅S Benzenesulfonic acid, aminonitro- Benzenesulfonic acid, 2-amino-5-nitro- Sulfanilic acid, 3-nitro- | C₆H₇N₃O₂ <i>m</i> -Phenylenediamine, 4-nitro- <i>o</i> -Phenylenediamine, 4-nitro- <i>p</i> -Phenylenediamine, 2-nitro- |
| C₆H₆N₂O₆S 1-Phenol-2-sulfonic acid, 4-amino-6-nitro- 1-Phenol-2-sulfonic acid, 6-amino-4-nitro- 1-Phenol-4-sulfonic acid, 2-amino-6-nitro- | C₆H₈N₂ <i>m</i> -Phenylenediamine <i>o</i> -Phenylenediamine <i>p</i> -Phenylenediamine |
| C₆H₆O Phenol | C₆H₈N₂O₂S Metanilamide Sulfanilamide |
| C₆H₆O₂ Pyrocatechol <i>o</i> -Dihydroxybenzene Resorcinol <i>m</i> -Dihydroxybenzene | C₆H₈N₂O₃S Benzenesulfonic acid, 2,4-diamino- <i>m</i> -Phenylenediamine sulfonic acid 1-Phenol-3-sulfonamide, 2-amino- 1-Phenol-4-sulfonamide, 2-amino- |
| C₆H₆O₃ 1,2,4-Benzenetriol Benzene, 1,2,4-trihydroxy- 1,3,5-Benzenetriol Phloroglucinol Pyrogallol Benzene, 1,2,3-trihydroxy- | C₆H₈N₂O₄S 1-Phenol-4-sulfonic acid, 2,6-diamino- |
| C₆H₆O₄S 1-Phenol-2-sulfonic acid 1-Phenol-3-sulfonic acid | C₆H₈N₂O₆S₂ <i>m</i> -Benzenedisulfonic acid, 2,5-diamino- <i>m</i> -Benzenedisulfonic acid, 4,6-diamino- |
| C₆H₆O₅S Benzenesulfonic acid, 2,4-dihydroxy- | C₆H₁₀ 1,3-Butadiene, 2,3-dimethyl- |
| C₆H₆O₆S Benzenesulfonic acid, 3,4,5-trihydroxy- Pyrogallol, 5-sulfo- | C₆H₁₀O₃ Acetoacetic acid, ethyl ester |
| C₆H₇ClN₂ <i>m</i> -Phenylenediamine, 4-chloro- <i>o</i> -Phenylenediamine, 4-chloro- <i>p</i> -Phenylenediamine, 2-chloro- | C₆H₁₃N Cyclohexylamine |
| C₆H₇ClN₂O₃S Benzenesulfonic acid, 3,5-diamino-4-chloro- | C₇H₃Cl₂NO₃ Benzaldehyde, 2,6-dichloro-3-nitro- |
| C₆H₇N Aniline | C₇H₃Cl₃O Benzaldehyde, 2,3,6-trichloro- Benzoyl chloride, 2,5-dichloro- |
| C₆H₇NO Phenol, <i>m</i> -amino- Phenol, <i>o</i> -amino- Phenol, <i>p</i> -amino- | C₇H₄BrClO Benzoyl chloride, <i>m</i> -bromo- |
| C₆H₇NO₃S Benzenesulfonic acid, <i>o</i> -amino- Orthanilic acid Metanilic acid Benzenesulfonic acid, <i>m</i> -amino- Sulfanilic acid Benzenesulfonic acid, <i>p</i> -amino- | C₇H₄ClNO₃ Benzaldehyde, 2-chloro-4-nitro- Benzaldehyde, 2-chloro-5-nitro- Benzaldehyde, 2-chloro-6-nitro- |
| C₆H₇NO₄S 1-Phenol-2-sulfonic acid, 4-amino- 1-Phenol-2-sulfonic acid, 5-amino- 1-Phenol-4-sulfonic acid, 2-amino- 1-Phenol-4-sulfonic acid, 3-amino- | C₇H₄Cl₂O Benzaldehyde, 2,5-dichloro- Benzaldehyde, 2,6-dichloro- Benzoyl chloride, <i>o</i> -chloro- Benzoyl chloride, <i>p</i> -chloro- |
| C₆H₇NO₆S₂ <i>m</i> -Benzenedisulfonic acid, 4-amino- <i>p</i> -Benzenedisulfonic acid, 2-amino- | C₇H₄Cl₂O₂ Salicylaldehyde, 3,5-dichloro- Benzaldehyde, 3,5-dichloro-2-hydroxy- |
| C₆H₇NO₇S₂ 1-Phenol-2,4-disulfonic acid, 6-amino- 1-Phenol-2,6-disulfonic acid, 4-amino- | C₇H₄Cl₂O₄S Benzenesulfonic acid, 2,4-dichloro-3-formyl- |
| | C₇H₅BrO₃ Salicylic acid, 5-bromo- |
| | C₇H₅BrO₆S Salicylic acid, 5-bromo-3-sulfo- |
| | C₇H₅ClF₃N <i>m</i> -Toluidine, 6-chloro- <i>α,α,α</i> -trifluoro- Aniline, 2-chloro-5-trifluoromethyl- <i>o</i> -Toluidine, 4-chloro- <i>α,α,α</i> -trifluoro- Aniline, 4-chloro-2-trifluoromethyl- |

C₇H₅ClO
Benzaldehyde, *o*-chloro-
Benzaldehyde, *p*-chloro-
Benzoyl chloride

C₇H₅Cl₂NO₂
Anthranilic acid, 3,5-dichloro-

C₇H₅Cl₃
Toluene, α,α,α -trichloro-
Benzotrichloride

C₇H₅F₃N₂O₂
p-Toluidine, α,α,α -trifluoro-2-nitro-

C₇H₅NO₃
Benzaldehyde, *m*-nitro-
Benzaldehyde, *o*-nitro-

C₇H₅NO₃S
Saccharin

C₇H₅N₃O₇
Anisole, 2,4,6-trinitro-

C₇H₆ClNO
Benzaldehyde, 5-amino-2-chloro-

C₇H₆ClNO₂
Anthranilic acid, 3-chloro-
Anthranilic acid, 4-chloro-
Benzoic acid, 5-amino-2-chloro-

C₇H₆ClNO₅S
Benzoic acid, 5-amino-2-chloro-4-sulfo-

C₇H₆N₂
Benzonitrile, *m*-amino-

C₇H₆N₂O₄
Anthranilic acid, 5-nitro-
Toluene, *o*, α -dinitro-
Toluene, 2,4-dinitro-

C₇H₆N₂O₅
Cresol, dinitro-

C₇H₆N₂O₇S
o-Toluenesulfonic acid, 3,5-dinitro-

C₇H₆N₂S
Aniline, *p*-thiocyanato-

C₇H₆O
Benzaldehyde

C₇H₆O₂
Benzaldehyde, *m*-hydroxy-
Benzaldehyde, *p*-hydroxy-
Benzoic acid
Salicylaldehyde
Benzaldehyde, *o*-hydroxy-
p-Toluquinone
p-Benzoquinone, 2-methyl-

C₇H₆O₂S
Benzoic acid, *o*-mercapto-

C₇H₆O₃
Salicylic acid

C₇H₆O₄
 α -Resorcylic acid
Benzoic acid, 3,5-dihydroxy-
 β -Resorcylic acid
Benzoic acid, 2,4-dihydroxy-

C₇H₆O₄S
Benzenesulfonic acid, *o*-formyl-
Benzaldehyde-*o*-sulfonic acid

C₇H₆O₅
Gallic acid

C₇H₆O₇S₂
m-Benzenedisulfonic acid, 4-formyl-

C₇H₇Cl
Toluene, α -chloro-

C₇H₇ClN₂O₃
o-Anisidine, 5-chloro-4-nitro-

C₇H₇NO
Benzaldehyde, *m*-amino-
Benzaldehyde, *p*-amino-
Benzamide

C₇H₇NO₂
Anthranilic acid
Benzoic acid, *m*-amino-
Benzoic acid, *p*-amino-
Salicylamide
Toluene, *p*-nitro-

C₇H₇NO₃
Cresol, nitro-
Salicylic acid, 3-amino-
Salicylic acid, 5-amino-

C₇H₇NO₄
Gallamide

C₇H₇NO₅S
Anthranilic acid, 4-sulfo-
Anthranilic acid, 5-sulfo-
Benzoic acid, 3-amino-5-sulfo-
o-Toluenesulfonic acid, 5-nitro-
p-Toluenesulfonic acid, 3-nitro-

C₇H₇NO₆S
Salicylic acid, 3-amino-5-sulfo-
Salicylic acid, 5-amino-3-sulfo-

C₇H₈BrNO
o-Anisidine, 5-bromo-

C₇H₈ClN
o-Toluidine, 3-chloro-
o-Toluidine, 4-chloro-
o-Toluidine, 5-chloro-
o-Toluidine, 6-chloro-
p-Toluidine, 3-chloro-

C₇H₈ClNO
o-Anisidine, 4-chloro-
o-Anisidine, 5-chloro-
p-Anisidine, 3-chloro-

C₇H₈ClNO₃S
m-Toluenesulfonic acid, 4-amino-5-chloro-
m-Toluenesulfonic acid, 6-amino-4-chloro-
o-Toluenesulfonic acid, 5-amino-3-chloro-
p-Toluenesulfonic acid, 2-amino-5-chloro-
p-Toluenesulfonic acid, 3-amino-5-chloro-

C₇H₈N₂O
Formanilide, *m*-amino-
Formanilide, *p*-amino-

C₇H₈N₂O₂
o-Toluidine, 4-nitro-
o-Toluidine, 5-nitro-
p-Toluidine, 2-nitro-

C₇H₈N₂O₃
o-Anisidine, 4-nitro-
o-Anisidine, 5-nitro-
p-Anisidine, 2-nitro-
p-Anisidine, 3-nitro-
o-Cresol, 6-amino-4-nitro-
p-Cresol, 2-amino-3-nitro-
p-Cresol, 2-amino-5-nitro-
p-Cresol, 2-amino-6-nitro-

C₇H₈N₂O₄S
 Benzenesulfonic acid, 2-amino-4-formamido-

C₇H₈N₂O₆S
 Metanilic acid, 4-methoxy-6-nitro-

C₇H₈O
 Cresol (crude)
m-Cresol
o-Cresol
p-Cresol

C₇H₈O₂
 Phenol, *m*-methoxy-
 Resorcinol monomethyl ether

C₇H₈S
p-Toluenethiol

C₇H₉CIN₂
 Toluene-3,5-diamine, 2-chloro-

C₇H₉CIN₂O
p-Phenylenediamine, 2-chloro-5-methoxy-

C₇H₉N
m-Toluidine
o-Toluidine
p-Toluidine

C₇H₉NO
o-Anisidine
p-Anisidine
p-Cresol, 2-amino-
p-Cresol, 3-amino-

C₇H₉NO₂S
p-Toluenesulfonamide

C₇H₉NO₃S
 Methanesulfonic acid, anilino-
α-Toluenesulfonic acid, *p*-amino-
 Phenol, 2-amino-4-(methylsulfonyl)-
m-Toluenesulfonic acid, 4-amino-
m-Toluenesulfonic acid, 6-amino-
o-Toluenesulfonic acid, 3-amino-
o-Toluenesulfonic acid, 4-amino-
o-Toluenesulfonic acid, 5-amino-

C₇H₉NO₄S
 Benzenesulfonic acid, 2-amino-5-methoxy-
 Metanilic acid, 4-methoxy-
 Metanilic acid, 6-methoxy-
 Sulfanilic acid, 3-methoxy-
m-Toluenesulfonic acid, 5-amino-6-hydroxy-

C₇H₉NO₅S
 1-Phenol-2-sulfonic acid, 6-amino-4-methoxy-

C₇H₉N₃O₂
 Toluene-2,4-diamine, 5-nitro-

C₇H₁₀N₂
p-Phenylenediamine, *N*-methyl-
 Toluene-2,4-diamine
m-Tolylenediamine
 Toluene-2,5-diamine
p-Tolylenediamine
 Toluene-2,6-diamine

C₇H₁₀N₂O
m-Phenylenediamine, 4-methoxy-

C₇H₁₀N₂O₃S
 1-Phenol-4-sulfonamide, 2-amino-*N*-methyl-
m-Toluenesulfonic acid, 4,6-diamino-
m-Tolylenediamine-5-sulfonic acid
p-Toluenesulfonic acid, 3,5-diamino-

C₇H₁₀N₂O₄S
 Benzenesulfonic acid, 2,5-diamino-4-methoxy-

C₇H₁₁NO₄
 Acetic acid, cyano-, butyl ester

C₈Cl₄O₃
 Phthalic anhydride, 3,4,5,6-tetrachloro-

C₈H₂Br₂CINO
 3-Pseudoindolone, 5,7-dibromo-2-chloro-
 Isatin-*α*-chloride, 5,7-dibromo-

C₈H₂Cl₂O₃
 Phthalic anhydride, 3,6-dichloro-

C₈H₂Cl₃NO
 3-Pseudoindolone, 2,5,7-trichloro-
 Isatin-*α*-chloride, 5,7-dichloro-

C₈H₂Cl₄O₄
 Phthalic acid, 3,4,5,6-tetrachloro-

C₈H₃BrCINO
 3-Pseudoindolone, 5-bromo-2-chloro-
 Isatin-*α*-chloride, 5-bromo-

C₈H₃BrO₃
 Phthalic anhydride, 3-bromo-

C₈H₃Br₂NO₂
 Isatin, 5,7-dibromo-

C₈H₃Cl₂NO₂
 Isatin, 5,7-dichloro-

C₈H₃Cl₃OS
 3(2*H*)-Thianaphthenone, 5,6,7-trichloro-
 Thioindoxyl, 5,6,7-trichloro-

C₈H₃Cl₄NO
 Pseudoindoxyl, 2,2,5,7-tetrachloro-
 Isatindichloride, dichloro-

C₈H₄BrNO₂
 Isatin, 5-bromo-

C₈H₄CINO
 3-Pseudoindolone, 2-chloro-
 Isatin-*α*-chloride

C₈H₄Cl₂OS
 3(2*H*)-Thianaphthenone, 5,7-dichloro-
 Thioindoxyl, 5,7-dichloro-
 3(2*H*)-Thianaphthenone, 4,7-dichloro-
 Thioindoxyl, 4,7-dichloro-

- C₈H₄Cl₂O₂**
Isophthaloyl chloride
Terephthaloyl chloride
- C₈H₄Cl₂O₄**
Phthalic acid, dichloro-
- C₈H₄F₄O**
m-Toluyll fluoride, *α,α,α*-trifluoro-
- C₈H₄N₂**
Phthalonitrile
- C₈H₄N₂O₄**
Isatin, 5-nitro-
- C₈H₄O₂S**
Thianaphthenequinone
Thioisatin
- C₈H₄O₃**
Phthalic anhydride
- C₈H₅BrO₄**
Phthalic acid, 3-bromo-
- C₈H₅Br₂NO**
Pseudoindoxyl, 5,7-dibromo-
- C₈H₅ClOS**
3(2*H*)-Thianaphthenone, 7-chloro-
Thioindoxyl, 7-chloro-
- C₈H₅Cl₂NOS**
3(2*H*)-Thianaphthenone, 6-amino-5,7-dichloro-
Thioindoxyl, 6-amino-5,7-dichloro-
- C₈H₅F₆N**
3,5-Xylidine, *α,α,α,α',α',α'*-hexafluoro-
Aniline, 3,5-bis(trifluoromethyl)-
- C₈H₅NO₂**
Isatin
Phthalimide
- C₈H₆BrNO**
Pseudoindoxyl, 5-bromo-
- C₈H₆CINO**
Pseudoindoxyl, 6-chloro-
- C₈H₆CINO₄S**
Acetic acid, (4-chloro-2-nitrophenylmercapto)-
Thioglycollic acid, *o*-nitro-*p*-chlorophenyl-
- C₈H₆Cl₂O₂**
Benzaldehyde, 2,6-dichloro-3-methoxy-
- C₈H₆OS**
3(2*H*)-Thianaphthenone
Thioindoxyl
- C₈H₆O₇S**
Phthalic acid, 4-sulfo-
- C₈H₇CIN₂**
o-Tolunitrile, 4-amino-5-chloro-
- C₈H₇ClO₂**
Anisoyl chloride
Benzoyl chloride, *m*-methoxy-
- C₈H₇ClO₂S**
Acetic acid, (*m*-chlorophenylmercapto)-
Thioglycollic acid, *m*-chlorophenyl-
- C₈H₇NO**
Oxindole
Pseudoindoxyl
Indoxyl
- C₈H₇NOS**
3(2*H*)-Thianaphthenone, 5-amino-
Thioindoxyl, 5-amino-
3(2*H*)-Thianaphthenone, 6-amino-
Thioindoxyl, 6-amino-
- C₈H₇NO₃**
m-Tolualdehyde, 2-nitro-
m-Tolualdehyde, 6-nitro-
- C₈H₇NO₄S**
Acetic acid, (*o*-nitrophenylmercapto)-
- C₈H₇NS**
Benzothiazole, 2-methyl-
- C₈H₇N₃**
Isoindoline, 1,3-diimino-
- C₈H₇N₃O₅**
Acetanilide, 2,4-dinitro-
- C₈H₈CINO₃**
Acetic acid, (2-amino-4-chlorophenoxy)-
- C₈H₈N₂**
Glycinonitrile, *N*-phenyl-
Phenylglycinenitrile
- C₈H₈N₂OS**
Benzothiazole, 2-amino-6-methoxy-
- C₈H₈N₂O₂**
Formamide, *N,N'*-*p*-phenylenebis-
Phthalamide
- C₈H₈N₂O₃**
Oxanilic acid, *m*-amino-
Oxanilic acid, *p*-amino-
- C₈H₈N₂O₅**
Acetic acid, (2-amino-5-nitrophenoxy)-
- C₈H₈N₂O₆S**
Oxanilic acid, 4'-amino-2'-sulfo-
Oxanilic acid, 4'-amino-3'-sulfo-
- C₈H₈N₂O₇S**
Xylenesulfonic acid, dinitro-
- C₈H₈N₂S**
Benzothiazole, 6-amino-2-methyl-
- C₈H₈O₂**
o-Toluic acid
p-Toluic acid
- C₈H₈O₃**
2,3-Cresotic acid
2,4-Cresotic acid
2,5-Cresotic acid
- C₈H₈O₄**
β-Resorcylic acid, 3-methyl-
- C₈H₈O₅**
Gallic acid, methyl ester
- C₈H₈CIN₂O₂**
Glycine, *N*-(3-amino-4-chlorophenyl)-
- C₈H₉NO**
Acetanilide
Acetophenone, *o*-amino-
Acetophenone, *p*-amino-

C₈H₉NO₂
 Acetanilide, *p*-hydroxy-
 Benzoic acid, *p*-amino-, methyl ester
 Glycine, *N*-phenyl-

C₈H₉NO₃
p-Anisic acid, 3-amino-
 2,3-Cresotic acid, 5-amino-

C₈H₉N₂O₄
 Acetanilide, 3'-amino-2'-hydroxy-5'-nitro-

C₈H₉N₃O₃
 Acetanilide, 4'-amino-3'-nitro-

C₈H₉N₃O₄
 Acetanilide, 3'-amino-4'-hydroxy-5'-nitro-
 Phenol, 4-acetamido-2-amino-6-nitro-

C₈H₉N₃S₂
 Pyrrolo[3,4-*b*]-*p*-dithiin, 5,7-dihydro-5,7-diimino-2,3-dimethyl-
 4,7-Dithiaisindoline, 1,3-diimino-5,6-dimethyl-

C₈H₁₀ClNO
o-Anisidine, 4-chloro-3-methyl-
o-Anisidine, 4-chloro-5-methyl-

C₈H₁₀ClNO₂
 Aniline, 4-chloro-2,5-dimethoxy-
 Aniline, 5-chloro-2,4-dimethoxy-

C₈H₁₀ClNO₃
 Benzenesulfonic acid, 2-amino-5-chloro-4-ethyl-

C₈H₁₀N₂O
 Acetanilide, *m*-amino-
 Acetanilide, *p*-amino-
 Aniline, *N,N*-dimethyl-*p*-nitroso-
o-Formotoluidide, 5'-amino-
o-Toluidine, *N*-methyl-4-nitroso-

C₈H₁₀N₂O₂
 Glycine, *N*-(*m*-aminophenyl)-

C₈H₁₀N₂O₃
o-Anisidine, 5-methyl-4-nitro-
 Nitroresidine

C₈H₁₀N₂O₄S
 Benzenesulfonic acid, 4-acetamido-2-amino-
 Benzenesulfonic acid, 5-acetamido-2-amino-

C₈H₁₀N₂O₅S
 1-Phenol-2-sulfonic acid, 4-acetamido-6-amino-
 Glycine, *N*-(3-amino-4-sulfophenyl)-

C₈H₁₀O
 2,4-Xylenol

C₈H₁₀O₃
 Phenol, 2,3-dimethoxy-

C₈H₁₀O₃S
 2,4-Xylenesulfonic acid
p-Toluenesulfonic acid, methyl ester

C₈H₁₁N
 Aniline, *N,N*-dimethyl-
 Aniline, ethyl-
o-Toluidine, *N*-methyl-
 Xylidines (mixed)
 2,4-Xylidine
m-Xylidine
 2,5-Xylidine
p-Xylidine
 2,6-Xylidine
vic-m-Xylidine
 3,5-Xylidine
sym-m-Xylidine

C₈H₁₁NO
o-Anisidine, 5-methyl-
 Cresidine
p-Anisidine, *N*-methyl-
p-Anisidine, 3-methyl-
p-Cresol, 3-methylamino-
 Ethanol, 2-*p*-aminoanilino-
o-Phenetidine
p-Phenetidine
 Phenol, *m*-dimethylamino-
 Phenol, *m*-ethylamino-

C₈H₁₁NO₂
 Aniline, 2,5-dimethoxy-
 Ethanol, 2-(*p*-aminophenoxy)-

C₈H₁₁NO₆
 Ethanol, 2-(*m*-aminophenylsulfonyl)-, sulfate ester

C₈H₁₁NO₃S
 2,4-Xylenesulfonic acid, 5-amino-
 2,5-Xylenesulfonic acid, 6-amino-
 3,5-Xylenesulfonic acid, 2-amino-

C₈H₁₁NO₄S
 Benzenesulfonic acid, 2-amino-5-ethoxy-
 Metanilic acid, 6-ethoxy-
o-Toluenesulfonic acid, 4-amino-5-methoxy-

C₈H₁₁NO₆S₂
 Benzenesulfonic acid, *o*-(2-sulfoethylamino)-
 Taurine, *o*-sulfophenyl-

C₈H₁₁N₃O
 Acetanilide, 2',4'-diamino-

C₈H₁₁N₃S
 Urea, 1-(3-amino-*p*-tolyl)-2-thio-

C₈H₁₂N₂
 Hydrazine, *N*-ethyl-*N*-phenyl-
p-Phenylenediamine, *N,N*-dimethyl-
p-Phenylenediamine, *N*-ethyl-
 Toluene-2,5-diamine, *N*-methyl-

C₈H₁₂N₂O
 Ethanol, 2-(*m*-aminoanilino)-
 Ethanol, 2-(*p*-aminoanilino)-
m-Phenylenediamine, 4-ethoxy-
o-Phenylenediamine, 4-ethoxy-

C₈H₁₂N₂O₆S₂
 Methanesulfonic acid, (*m*-phenylenediimino)di-

C₈H₁₂O₂
 1,3-Cyclohexanedione, 5,5-dimethyl-

C₉H₅NO₃
 3*H*-Pseudindole-2-carboxylic acid, 3-oxo-
 Isatin-*α*-carboxylic acid

C₉H₅NO₄
Propiolic acid, *o*-nitrophenyl-

C₉H₆ClNO₂
Isatin, 6-chloro-7-methyl-

C₉H₆Cl₂OS
3(2*H*)-Thianaphthenone, 5,7-dichloro-4-methyl-
Thioindoxyl, 5,7-dichloro-4-methyl-

C₉H₆Cl₂O₂S
3(2*H*)-Thianaphthenone, 6,7-dichloro-3-methoxy-
Thioindoxyl, 6,7-dichloro-3-methoxy-

C₉H₆O₃S
2-Thianaphthenecarboxylic acid, 2,3-dihydro-3-oxo-
3(2*H*)-Thianaphthenone, 2-carboxy-

C₉H₆O₇
Trimellitic acid, 5-hydroxy-

C₉H₇BrOS
3(2*H*)-Thianaphthenone, 6-bromo-4-methyl-
Thioindoxyl, 6-bromo-4-methyl-

C₉H₇ClO
Cinnamoyl chloride

C₉H₇ClOS
3(2*H*)-Thianaphthenone, 6-chloro-4-methyl-

C₉H₇N
Isoquinoline

C₉H₇NO
8-Quinololinol

C₉H₇NO₂
2,4-Quinolinediol

C₉H₇NO₃S
2-Thianaphthenecarboxylic acid,
6-amino-2,3-dihydro-3-oxo-
3(2*H*)-Thianaphthenone, 6-amino-2-carboxy-

C₉H₈O₂
Cinnamic acid

C₉H₈O₂S
3(2*H*)-Thianaphthenone, 6-methoxy-
Thioindoxyl, 6-methoxy-

C₉H₈O₄
2,3-Cresotic acid, 5-formyl-

C₉H₈O₄S
Benzoic acid, *o*-(carboxymethylmercapto)-

C₉H₉ClN₂O₄
Oxanilic acid, 4'-amino-5'-chloro-2'-methoxy-

C₉H₉ClO₂S
Acetic acid, (3-chloro-*o*-tolylmercapto)-
Thioglycollic acid, 3-chloro-2-methylphenyl-
Acetic acid, (4-chloro-*o*-tolylmercapto)-
Thioglycollic acid, 4-chloro-2-methylphenyl-
Acetic acid, (5-chloro-*o*-tolylmercapto)-
Thioglycollic acid, 5-chloro-2-methylphenyl-

C₉H₉N
Indole, 2-methyl-
Indole, 3-methyl-

C₉H₉NO
Pseudoindoxyl, 7-methyl-

C₉H₉NO₃S
Indolesulfonic acid, 2-methyl-

C₉H₉NO₄
Anthranilic acid, *N*-(carboxymethyl)-

C₉H₁₀ClNO
Benzoyl chloride, *p*-dimethylamino-

C₉H₁₀F₃NO₂S
m-Toluidine, 6-(ethylsulfonyl)- α,α,α -trifluoro-
Aniline, 2-ethylsulfonyl-5-trifluoromethyl-

C₉H₁₀N₂OS
Benzothiazole, 2-amino-6-ethoxy-

C₉H₁₀N₂O₂
Benzonitrile, 4-amino-2,5-dimethoxy-
Formamide, *N,N'*-2,4-tolylenebis-

C₉H₁₀N₂O₃
p-Acetotoluidide, 3'-nitro-
Oxanilic acid, 3'-amino-4'-methyl-

C₉H₁₀N₂O₆S
Oxanilic acid, 3'-amino-2'-methyl-5'-sulfo-

C₉H₁₀O₃
2,4-Xylic acid, 6-hydroxy-

C₉H₁₁ClO₃S
p-Toluenesulfonic acid, 2-chloroethyl ester

C₉H₁₁N
Indoline, 2-methyl-

C₉H₁₁NO
o-Acetotoluidide
Benzaldehyde, *p*-dimethylamino-

C₉H₁₁NO₂
m-Acetotoluidide, 6'-hydroxy-
Benzoic acid, *m*-amino-, ethyl ester
Benzoic acid, *p*-amino-, ethyl ester

C₉H₁₂ClNO₃S
p-Cumenesulfonic acid, 2-amino-5-chloro-

C₉H₁₂N₂O
Acetanilide, *p*-amino-*N*-methyl-
m-Acetotoluidide, 4'-amino-
p-Acetotoluidide, 3'-amino-
Formanilide, *p*-amino-*N*-ethyl-

C₉H₁₂N₂O₂
p-Acetanilide, 3'-amino-
o-Acetanilide, 4'-amino-
p-Cresol, 5-dimethylamino-2-nitroso-
Glycine, *N*-(5-amino-*o*-tolyl)-

C₉H₁₂N₂O₅S
Benzenesulfonic acid, 5-acetamido-2-amino-4-methoxy-

C₉H₁₂O₃
p-Cresol, 2,3-dimethoxy-

C₉H₁₃N
Aniline, 2,4,6-trimethyl-
Pseudocumidine
m-Toluidine, *N,N*-dimethyl-
o-Toluidine, *N*-ethyl-
p-Toluidine, *N*-ethyl-

C₉H₁₃NO
p-Cresol, 3-ethylamino-
Ethanol, 2-(*N*-methylanilino)-
Ethanol, 2-*m*-toluidino-
o-Phenetidine, 5-methyl-

C₉H₁₃NO₂
1,2-Propanediol, 3-anilino-

C₉H₁₃NO₃S
o-Anisidine, 5-(ethylsulfonyl)-
Methanesulfonic acid, (*N*-ethylanilino)-
Taurine, *N*-*o*-tolyl-

C₉H₁₄N₂
Toluene- α ,4-diamine, *N* ^{α} ,*N* ^{α} -dimethyl-
Toluene-2,4-diamine, *N*²,*N*²-dimethyl-
Toluene-2,4-diamine, *N*⁴,*N*⁴-dimethyl-
Toluene-2,5-diamine, *N*²-ethyl-

C₉H₁₄N₂O₂
1,2-Propanediol, 3-(*p*-aminoanilino)-

C₉H₁₄N₂O₂S

p-Toluenesulfonamide, 3-amino-*N,N*-dimethyl-

C₉H₁₄N₂O₃S
Taurine, *N*-(*p*-aminophenyl)-*N*-methyl-

C₉H₁₄N₂O₆S₂
Benzenesulfonic acid, 5-amino-2-
[methyl(2-sulfoethyl)amino]-

C₉H₁₅ClN₂
Ammonium chloride, (*m*-aminophenyl)trimethyl-

C₁₀H₃BrN₄O₈
Naphthalene, 1-bromo-2,4,6,8-tetranitro-

C₁₀H₄Cl₂O₂
1,4-Naphthoquinone, 2,3-dichloro-

C₁₀H₅ClO₂
1,2-Naphthoquinone, 4-chloro-

C₁₀H₆Cl₃NO
3-Pseudoindolone, 2,5,7-trichloro-4,6-dimethyl-

C₁₀H₆N₂O₄
Naphthalene, 1,5-dinitro-
Naphthalene, 1,8-dinitro-

C₁₀H₆O₂
1,2-Naphthoquinone
 β -Naphthoquinone
1,4-Naphthoquinone

C₁₀H₆O₅S
1-Naphthalenesulfonic acid, 3,4-dihydro-3,4-dioxo-
2-Naphthalenesulfonic acid, 5,6-dihydro-5,6-dioxo-

C₁₀H₆O₈S₂
1,7-Naphthalenedisulfonic acid, 3,4-dihydro-3,4-dioxo-

C₁₀H₇BrO
1-Naphthol, 4-bromo-

C₁₀H₇Cl
Naphthalene, 2-chloro-

C₁₀H₇ClO
1-Naphthol, 4-chloro-

C₁₀H₇ClO₄S
1-Naphthol-5-sulfonic acid, 8-chloro-

C₁₀H₇ClO₇S₂
1-Naphthol-3,6-disulfonic acid, 8-chloro-

C₁₀H₇Cl₃N₂O₄S
Benzenesulfonic acid, 2,4,5-trichloro-3-
(3-methyl-5-oxo-2-pyrazolin-1-yl)-

C₁₀H₇NO₂
1-Naphthol, 2-nitroso-
2-Naphthol, 1-nitroso-

C₁₀H₇NO₅S
1-Naphthol-4-sulfonic acid, 2-nitroso-

C₁₀H₇N₃O₅
2-Pyrazoline-3-carboxylic acid, 1-(*m*-nitrophenyl)-5-oxo-
5-Pyrazolone, 3-carboxy-1-(*m*-nitrophenyl)-

C₁₀H₇N₃O₆S₂
1*H*-Naphtho[1,8]triazine-5,8-disulfonic acid

C₁₀H₈
Naphthalene

C₁₀H₈CIN
Quinaldine, 6-chloro-
Quinaldine, 8-chloro-

C₁₀H₈CINO₄S
1-Naphthol-3-sulfonic acid, 6-amino-5-chloro-
2-Naphthol-4-sulfonic acid, 1-amino-6-chloro-

C₁₀H₈Cl₂N₂O₄S
Benzenesulfonic acid, 2,5-dichloro-4-
(3-methyl-5-oxo-2-pyrazolin-1-yl)-
5-Pyrazolone, 1-(2,5-dichloro-4-sulfophenyl)-3-
methyl-

C₁₀H₈N₂O₂
1(4*H*)-Naphthalenone, 8-amino-5-hydroxy-4-imino-
1,4-Naphthoquinone imine, 8-amino-5-hydroxy-

C₁₀H₈N₂O₃
2-Pyrazoline-3-carboxylic acid, 5-oxo-1-phenyl-
1-Phenyl-5-pyrazolone-3-carboxylic acid

C₁₀H₈N₂O₅S
2-Naphthalenesulfonic acid, 5(and 8)-amino-8(and 5)-nitro-

C₁₀H₈N₂O₆S
2-Naphthol-4-sulfonic acid, 1-amino-6-nitro-
2-Pyrazoline-3-carboxylic acid, 5-oxo-1-(*o*-sulfophenyl)-
5-Pyrazolone, 3-carboxy-1-(*o*-sulfophenyl)-
2-Pyrazoline-3-carboxylic acid, 5-oxo-1-(*p*-sulfophenyl)-
5-Pyrazolone, 3-carboxy-1-(*p*-sulfophenyl)-

C₁₀H₈N₂O₉S₂
2-Pyrazoline-3-carboxylic acid,
1-(2,5-disulfophenyl)-5-oxo-
5-Pyrazolone, 3-carboxy-1-(2,5-disulfophenyl)-

C₁₀H₈O
1-Naphthol
 α -Naphthol
2-Naphthol
 β -Naphthol

C₁₀H₈O₂
1,5-Naphthalenediol
1,6-Naphthalenediol
1,7-Naphthalenediol
2,6-Naphthalenediol
2,7-Naphthalenediol

C₁₀H₈O₄
Coumarin, 7,8-dihydroxy-4-methyl-

C₁₀H₈O₄S
1-Naphthol-4-sulfonic acid
Nevile and Winther's acid
1-Naphthol-3-sulfonic acid
1-Naphthol-5-sulfonic acid
Hydroxy L acid
1-Naphthol-8-sulfonic acid
2-Naphthol-4-sulfonic acid
2-Naphthol-6-sulfonic acid
Schaeffer's acid
2-Naphthol-7-sulfonic acid
F acid
2-Naphthol-8-sulfonic acid
Crocein acid

C₁₀H₈O₅S

- 1-Naphthalenesulfonic acid, 4,5-dihydroxy-Dihydroxy S acid
- 1-Naphthalenesulfonic acid, 4,6-dihydroxy-
- 2-Naphthalenesulfonic acid, 4,6-dihydroxy-Dihydroxy Gamma acid
- 2-Naphthalenesulfonic acid, 4,7-dihydroxy-Dihydroxy J acid

C₁₀H₈O₆S

- 2-Naphthalenesulfonic acid, 4,6,7-trihydroxy-

C₁₀H₈O₆S₂

- 2,7-Naphthalenedisulfonic acid

C₁₀H₈O₇S

- 2-Naphthoic acid, 1,7-dihydroxy-4-sulfo-
- 2-Naphthoic acid, 3,5-dihydroxy-7-sulfo-

C₁₀H₈O₇S₂

- 1-Naphthol-2,7-disulfonic acid
- 1-Naphthol-3,6-disulfonic acid
Violet acid
- 1-Naphthol-3,7-disulfonic acid
- 1-Naphthol-3,8-disulfonic acid
Epsilon acid
- 1-Naphthol-4,7-disulfonic acid
- 1-Naphthol-4,8-disulfonic acid
- 2-Naphthol-3,6-disulfonic acid
- 2-Naphthol-3,7-disulfonic acid
R acid
- 2-Naphthol-5,7-disulfonic acid
- 2-Naphthol-6,8-disulfonic acid
G acid

C₁₀H₈O₈S₂

- 2,7-Naphthalenedisulfonic acid, 4,5-dihydroxy-1,8-Dihydroxynaphthalene-3,6-disulfonic acid
Chromotropic acid

C₁₀H₈O₁₀S₃

- 1-Naphthol-2,4,7-trisulfonic acid
- 1-Naphthol-3,6,8-trisulfonic acid
- 2-Naphthol-3,6,8-trisulfonic acid

C₁₀H₉CIN₂O

- 5-Pyrazolone, 1-(*p*-chlorophenyl)-3-methyl-

C₁₀H₉CIN₂O₄S

- Benzenesulfonic acid,
3-chloro-2-(3-methyl-5-oxo-2-pyrazolin-1-yl)-5-Pyrazolone, 1-(2-chloro-6-sulfo-phenyl)-3-methyl-
- Benzenesulfonic acid,
3-chloro-4-(3-methyl-5-oxo-2-pyrazolin-1-yl)-5-Pyrazolone, 1-(2-chloro-4-sulfo-phenyl)-3-methyl-
- Benzenesulfonic acid,
4-chloro-3-(3-methyl-5-oxo-2-pyrazolin-1-yl)-5-Pyrazolone, 1-(2-chloro-4-sulfo-phenyl)-3-methyl-
- Benzenesulfonic acid,
5-chloro-2-(3-methyl-5-oxo-2-pyrazolin-1-yl)-5-Pyrazolone, 1-(4-chloro-2-sulfo-phenyl)-3-methyl-

C₁₀H₉CIN₂O₆S

- 2-Pyrazoline-3-carboxylic acid,
1-(6-chloro-4-sulfo-*o*-tolyl)-5-oxo-5-Pyrazolone,
3-carboxy-1-(6-chloro-4-sulfo-*o*-tolyl)-

C₁₀H₉ClOS

- 3(2*H*)-Thianaphthenone, 5-chloro-4,7-dimethyl-

C₁₀H₉N

- 1-Naphthylamine
 α -Naphthylamine
- 2-Naphthylamine
 β -Naphthylamine
- Quinaldine
Quinoline, α -methyl-
Quinoline, 2-methyl-
- Quinoline, 4-methyl-
Lepidine

C₁₀H₉NO

- 1-Naphthol, 5-amino-
- 2-Naphthol, 7-amino-
- 3-Quinolol, 2-methyl-
Quinaldine, 3-hydroxy-

C₁₀H₉NO₂

- Carbostyryl, 4-hydroxy-1-methyl-
4-Hydroxy-*N*-methyl-2-quinolone

C₁₀H₉NO₃

- 2-Indolineacetic acid, 3-oxo-

C₁₀H₉NO₃S

- 1-Naphthalenesulfonic acid, 2-amino-
Tobias acid
- Naphthionic acid
1-Naphthalenesulfonic acid, 4-amino-
- 1-Naphthalenesulfonic acid, 5-amino-
Laurent's acid
- 1-Naphthalenesulfonic acid, 6-amino-
- 1-Naphthalenesulfonic acid, 7-amino-
Amino Crocein acid
- 1-Naphthalenesulfonic acid, 6(and 7)-amino-
- 1-Naphthalenesulfonic acid, 8-amino-
Peri acid
- 2-Naphthalenesulfonic acid, 1-amino-
1-Naphthylamine-2-sulfonic acid
o-Naphthionic acid
- 2-Naphthalenesulfonic acid, 5-amino-
1-Naphthylamine-6-sulfonic acid
1,6-Cleve's acid
- 2-Naphthalenesulfonic acid, 6-amino-
2-Naphthylamine-6-sulfonic acid
Broenner's acid
- 2-Naphthalenesulfonic acid, 7-amino-
2-Naphthylamine-7-sulfonic acid
Amino F acid
- 2-Naphthalenesulfonic acid, 8-amino-
1-Naphthylamine-7-sulfonic acid
1,7-Cleve's acid
- 2-Naphthalenesulfonic acid, 5(and 8)-amino-
1-Naphthylamine-6/7-sulfonic acid
1,6/7-Cleve's acid
Cleve's acid
- 1-Naphthol-3-sulfonamide
- 1-Naphthol-8-sulfonamide
- 2-Naphthol-6-sulfonamide

C₁₀H₉NO₄S

- 1-Naphthol-3-sulfonic acid, 5-amino-
1-Amino-5-naphthol-7-sulfonic acid
M acid
- 1-Naphthol-3-sulfonic acid, 6-amino-
2-Amino-5-naphthol-7-sulfonic acid
J acid
- 1-Naphthol-3-sulfonic acid, 7-amino-
2-Amino-8-naphthol-6-sulfonic acid
Gamma acid
- 1-Naphthol-4-sulfonic acid, 2-amino-
- 1-Naphthol-5-sulfonic acid, 8-amino-
1-Amino-8-naphthol-4-sulfonic acid
S acid
- 2-Naphthol-4-sulfonic acid, 1-amino-
- 2-Naphthol-6-sulfonic acid, 1-amino-
- 2-Naphthol-8-sulfonic acid, 1-amino-
- 2-Naphthol-7-sulfonic acid, 3-amino-

C₁₀H₉NO₆S₂

- 1,3-Naphthalenedisulfonic acid, 6-amino-
Amino J acid
- 1,3-Naphthalenedisulfonic acid, 7-amino-
2-Naphthylamine-6,8-disulfonic acid
Amino G acid
- 1,5-Naphthalenedisulfonic acid, 3-amino-
2-Naphthylamine-4,8-disulfonic acid
C acid
- 1,5-Naphthalenedisulfonic acid, 4-amino-
1-Naphthylamine-4,8-disulfonic acid
- 1,6-Naphthalenedisulfonic acid, 2-amino-
2-Naphthylamine-1,6-disulfonic acid
- 1,6-Naphthalenedisulfonic acid, 4-amino-
1-Naphthylamine-4,7-disulfonic acid
- 1,6-Naphthalenedisulfonic acid, 8-amino-
1-Naphthylamine-3,8-disulfonic acid
Amino Epsilon acid
- 1,7-Naphthalenedisulfonic acid, 4-amino-
2,6-Naphthalenedisulfonic acid, 3-amino-
2,6-Naphthalenedisulfonic acid, 4-amino-
1-Naphthylamine-3,7-disulfonic acid
- 2,7-Naphthalenedisulfonic acid, 4-amino-
1-Naphthylamine-3,6-disulfonic acid
- 2,7-Naphthalenedisulfonic acid, 3-amino-
2-Naphthylamine-3,6-disulfonic acid
Amino R acid
- 2,7-Naphthalenedisulfonic acid, 1-amino-
1-Naphthol-3-sulfonic acid, 8-sulfamoyl-

C₁₀H₉NO₇S₂

- 1-Naphthol-3,5-disulfonic acid, 6-amino-
1-Naphthol-3,5-disulfonic acid, 8-amino-
1-Amino-8-naphthol-4,6-disulfonic acid
K acid
- 1-Naphthol-3,6-disulfonic acid, 7-amino-
2-Amino-8-naphthol-3,6-disulfonic acid
2 R acid
- 1-Naphthol-3,6-disulfonic acid, 8-amino-
1-Amino-8-naphthol-3,6-disulfonic acid
H acid
- 1-Naphthol-4,6-disulfonic acid, 8-amino-
1-Naphthol-5,7-disulfonic acid, 8-amino-
1-Amino-8-naphthol-2,4-disulfonic acid
2 S acid; Chicag acid

C₁₀H₉N₃O₂

- 2-Pyrazoline-3-carboxamide, 5-oxo-1-phenyl-
5-Pyrazolone, 3-carbamoyl-1-phenyl-

C₁₀H₉N₃O₃

- 2-Pyrazoline-3-carboxylic acid, 1-(*m*-aminophenyl)-5-oxo-
5-Pyrazolone, 1-(*m*-aminophenyl)-3-carboxy-
5-Pyrazolone, 3-methyl-1-(*m*-nitrophenyl)-
5-Pyrazolone, 3-methyl-1-(*p*-nitrophenyl)-

C₁₀H₁₀CINO

- Pseudoindoxyl, 5-chloro-7-methoxy-4-methyl-

C₁₀H₁₀CINO₂

- Acetoacetanilide, *o*-chloro-
Acetoacetanilide, *p*-chloro-

C₁₀H₁₀N₂

- 1,5-Naphthalenediamine
2,6-Naphthalenediamine
2,7-Naphthalenediamine

C₁₀H₁₀N₂O

- 5-Pyrazolone, 3-methyl-1-phenyl-

C₁₀H₁₀N₂O₃S

- 1-Naphthalenesulfonic acid, 4,5-diamino-
1-Naphthalenesulfonic acid, 2,5-diamino-
2-Naphthalenesulfonic acid, 1,4-diamino-
2-Naphthalenesulfonic acid, 5,8-diamino-

C₁₀H₁₀N₂O₄S

- Benzenesulfonic acid,
m-(3-methyl-5-oxo-2-pyrazolin-1-yl)-
5-Pyrazolone, 3-methyl-1-(*m*-sulfophenyl)-
Benzenesulfonic acid,
p-(3-methyl-5-oxo-2-pyrazolin-1-yl)-
5-Pyrazolone, 3-methyl-1-(*p*-sulfophenyl)-

C₁₀H₁₀N₂O₆S₂

- 2,6-Naphthalenedisulfonic acid, 4,8-diamino-
2,7-Naphthalenedisulfonic acid, 3,6-diamino-
2,7-Naphthalenedisulfonic acid, 4,5-diamino-

C₁₀H₁₀OS₂

- 3(2*H*)-Thianaphthenone, 6-(ethylmercapto)-
Thioindoxyl, 6-(ethylmercapto)-

C₁₀H₁₀O₂S

- 3(2*H*)-Thianaphthenone, 6-ethoxy-
Thioindoxyl, 6-ethoxy-

C₁₀H₁₁ClO₃S

- Acetic acid, (4-chloro-6-methoxy-*m*-tolylmercapto)-

C₁₀H₁₁NO₂

- Acetoacetanilide

C₁₀H₁₁NO₃S

- Acetic acid, (*m*-acetamidophenylmercapto)-
Acetic acid, (*p*-acetamidophenylmercapto)-

C₁₀H₁₁NO₅S

- Sulfanilic acid, *N*-acetoacetyl-

C₁₀H₁₁N₃

- 2-Pyrazoline, 5-imino-3-methyl-1-phenyl-
Pyrazole, 5-amino-3-methyl-1-phenyl-

C₁₀H₁₁N₃O

- 5-Pyrazolone, 1-(*m*-aminophenyl)-3-methyl-
5-Pyrazolone, 1-(*p*-aminophenyl)-3-methyl-

C₁₀H₁₁N₃O₃S

- Benzenesulfonamide,
m-(3-methyl-5-oxo-2-pyrazolin-1-yl)-
5-Pyrazolone, 3-methyl-1-(*m*-sulfamolyphenyl)-

C₁₀H₁₂CINO

- Benzaldehyde, *p*-[(2-chloroethyl)methylamino]-

C₁₀H₁₂O

- 2-Naphthol, 5,6,7,8-tetrahydro-

C₁₀H₁₃CIN₂O₄S

- Benzenesulfonamide, 4-chloro-*N,N*-diethyl-3-nitro-

C₁₀H₁₃N

- 1-Naphthylamine, 5,6,7,8-tetrahydro-

C₁₀H₁₄CIN

- Aniline, *m*-chloro-*N,N*-diethyl-

C₁₀H₁₄CINO₂

- Ethanol, 2,2'-(*m*-chlorophenylimino)di-

C₁₀H₁₄N₂O

- Aniline, *N,N*-diethyl-*p*-nitroso-

C₁₀H₁₄N₂O₂

- o*-Acetanilide, 4'-amino-5'-methyl-
Phenol, 5-diethylamino-2-nitroso-

C₁₀H₁₄N₂O₄S

- Metanilic acid, 6-(*N*-ethylacetamido)-

C₁₀H₁₄O

- Phenol, *p*-*tert*-butyl-

C₁₀H₁₅N

- Aniline, *N,N*-diethyl-

C₁₀H₁₅NO
Ethanol, 2-(*N*-ethylanilino)-
Aniline, *N*-ethyl-*N*-β-hydroxyethyl-
Ethanol, 2-(*N*-methyl-*m*-toluidino)-
Phenol, *m*-diethylamino-

C₁₀H₁₅NO₂
Ethanol, 2,2'-(phenylimino)di-

C₁₀H₁₅NO₃S
Metanilic acid, *N,N*-diethyl-
Taurine, *N*-ethyl-*N*-phenyl-

C₁₀H₁₅NO₄S
Ethanol, 2-(*N*-ethylanilino)-, sulfate ester

C₁₀H₁₅NO₆S₂
Ethanol, 2-(4-amino-2,5-dimethoxyphenylsulfonyl)-, sulfate ester

C₁₀H₁₆N₂
m-Phenylenediamine, *N,N*-diethyl-
m-Phenylenediamine, *N,N'*-diethyl-
p-Phenylenediamine, *N,N*-diethyl-

C₁₀H₁₆N₂O₃S
1-Phenol-4-sulfonamide, 2-amino-*N,N*-diethyl-

C₁₀H₁₆N₂O₄S
Metanilamide, *N*¹,*N*¹-bis(2-hydroxyethyl)-

C₁₀H₁₈N₂O
Acetanilide, *m*-diethylamino-

C₁₁H₇BrO₃
2-Naphthoic acid, 7-bromo-3-hydroxy-

C₁₁H₈O₂
1-Naphthaldehyde, 2-hydroxy-

C₁₁H₈O₃
2-Naphthoic acid, 1-hydroxy-
2-Naphthoic acid, 3-hydroxy-

C₁₁H₈O₆S
2-Naphthoic acid, 1-hydroxy-7-sulfo-

C₁₁H₉NO₄S
2-Thianaphthenecarboxylic acid,
6-acetamido-2,3-dihydro-3-oxo-

C₁₁H₁₀N₂O₅S
1-Naphthol-3-sulfonic acid, 6-ureido-

C₁₁H₁₀N₂O₇S
Salicylic acid, 3-(3-methyl-5-oxo-2-pyrazolin-1-yl)-5-sulfo-
5-Pyrazolone,
1-(3-carboxy-2-hydroxy-5-sulfophenyl)-3-methyl-

C₁₁H₁₀O₂
1-Naphthol, 4-methoxy-

C₁₁H₁₀O₃S₂
2-Thianaphthenecarboxylic acid,
6-(ethylmercapto)-2,3-dihydro-3-oxo-
3(2*H*)-Thianaphthenone,
2-carboxy-6-ethylmercapto-

C₁₁H₁₁BrClNO₄
Anthranilic acid,
5-bromo-*N*-(carboxymethyl)-6-chloro-, dimethyl ester

C₁₁H₁₁CIN₂O₄S
m-Toluenesulfonic acid,
5-chloro-4-(3-methyl-5-oxo-2-pyrazolin-1-yl)-
5-Pyrazolone, 1-(6-chloro-4-sulfo-*o*-tolyl)-3-methyl-

C₁₁H₁₁N
1-Naphthylamine, *N*-methyl-
2-Naphthylamine, *N*-methyl-
p-Toluinaldehyde
Quinaldehyde, 6-methyl-

C₁₁H₁₁NO₃S
2-Naphthalenesulfonic acid, 7-methylamino-
N-Methylamino-*F* acid

C₁₁H₁₁NO₄S
1-Naphthol-3-sulfonic acid, 7-methylamino-
N-Methyl-Gamma acid

C₁₁H₁₁NO₇S₂
1-Naphthol-3-sulfonic acid, 7-(sulfomethylamino)-
N-Sulfomethyl-Gamma acid

C₁₁H₁₂N₂O
5-Pyrazolone, 3-methyl-1-*p*-tolyl-

C₁₁H₁₂N₂O₄S
m-Toluenesulfonic acid,
4-(3-methyl-5-oxo-2-pyrazolin-1-yl)-
5-Pyrazolone, 1-(4-sulfo-*o*-tolyl)-3-methyl-

C₁₁H₁₃NO₂
o-Acetoacetotoluidide
p-Acetoacetotoluidide

C₁₁H₁₃NO₃
o-Acetoacetanilide

C₁₁H₁₃NO₆S
Metanilic acid, *N*-acetoacetyl-4-methoxy-
Acetoacetanilide, 2'-methoxy-5'-sulfo-

C₁₁H₁₄ClNO
Benzaldehyde, 2-chloro-4-diethylamino-

C₁₁H₁₅NO
Benzaldehyde, *p*-diethylamino-

C₁₁H₁₆N₂O
p-Acetotoluidide, 3'-amino-*N*-ethyl-
Benzamide, *m*-amino-*N*-butyl-
m-Toluidine, *N,N*-diethyl-4-nitroso-
o-Toluidine, *N,N*-diethyl-4-nitroso-

C₁₁H₁₆N₂O₂
p-Cresol, 5-diethylamino-2-nitroso-

C₁₁H₁₇N
m-Toluidine, *N,N*-diethyl-
o-Toluidine, *N*-butyl-

C₁₁H₁₇NO
m-Anisidine, *N,N*-diethyl-
p-Cresol, 3-diethylamino-
Ethanol, 2-(*N*-ethyl-*m*-toluidino)-
m-Toluidine, *N*-ethyl-*N*-β-hydroxyethyl-

C₁₁H₁₇NO₂
Ethanol, 2,2'-(*m*-tolylimino)di-
1,2-Propanediol, 3-(*N*-ethylanilino)-

C₁₁H₁₈N₂
Toluene-α,4-diamine, *N*^α,*N*^α-diethyl-

C₁₁H₁₈N₂O₃S
Metanilamide, *N*¹,*N*¹-diethyl-4-methoxy-

C₁₁H₂₅N
Isohendecylamine

C₁₂H₄BrCl₂NO
3*H*-Benz[*f*]indole-3-one, 6-bromo-2,9-dichloro-

C₁₂H₅Cl₂NO
3*H*-Benz[*f*]indole-3-one, 2,9-dichloro-
9-Chloronaphthisatin-α-chloride

C₁₂H₅Cl₃N₂O₂
3*H*-Isophenoxazin-3-one, 7-amino-1,2,4-trichloro-

C₁₂H₆ClNO
1*H*-Benz[*e*]indol-1-one, 2-chloro-

C₁₂H₆Cl₂N₂O₆S
Sulfone, bis(4-chloro-3-nitrophenyl)
Diphenylsulfone, 4,4'-dichloro-3,3'-dinitro-

C₁₂H₆O₂
Acenaphthenequinone

C₁₂H₇ClOS
3(2*H*)-Thiophanthrenone, 9-chloro-
2,3-Naphthohydroxythiophen, 1-chloro-
Naphtho[2,1-*b*]thiophen-1(2*H*)-one, 9-chloro-

C₁₂H₇NO₂
3*H*-Benz[*e*]indole-1,2-dione
4,5-Benzoisatin
β-Naphthisatin
Naphthalimide

C₁₂H₇NO₃
Naphthalic anhydride, 4-amino-

C₁₂H₇NO₆S
Naphthalic anhydride, 4-amino-3-sulfo-

C₁₂H₇N₃O₄
Carbazole, 3,6-dinitro-

C₁₂H₈ClN₃O₅
Phenol, 4-chloro-2-(2,4-dinitroanilino)-

C₁₂H₈OS
Naphtho[2,1-*b*]thiophen-1(2*H*)-one
3(2*H*)-Thiophanthrenone
2,3-Naphthohydroxythiophen

C₁₂H₈O₂
2-Dibenzofuranol

C₁₂H₉Cl₂NO
Aniline, 3,5-dichloro-2-phenoxy-
Aniline, 5-chloro-2-(*p*-chlorophenoxy)-

C₁₂H₉NO₂
Indophenol
p-Quinone imine, *N*-(*p*-hydroxyphenyl)-

C₁₂H₉NO₃S
Taurine, *N*-butyl-*N*-phenyl-

C₁₂H₉N₃O
2-Phenazinol, 8-amino-

C₁₂H₉N₃O₄
Diphenylamine, 2,4-dinitro-

C₁₂H₉N₃O₅
Phenol, *o*-(2,4-dinitroanilino)-
Phenol, *p*-(2,4-dinitroanilino)-

C₁₂H₉N₃O₇
Sulfanilic acid, *N*-(2,4-dinitrophenyl)-

C₁₂H₁₀ClNO
Aniline, 5-chloro-2-phenoxy-
Aniline, *o*-(*p*-chlorophenoxy)-

C₁₂H₁₀ClNO₄S
Benzenesulfonic acid, *p*-(2-amino-4-chlorophenoxy)-

C₁₂H₁₀ClNO₅S
1-Naphthol-3-sulfonic acid, 6-(2-chloroacetamido)-
1-Naphthol-3-sulfonic acid, 6-(*α*-chloroacetamido)-

C₁₂H₁₀Cl₂N₂
Benzidine, 2,2'-dichloro-
Benzidine, 3,3'-dichloro-

C₁₂H₁₀N₂
Carbazole, 3-amino-

C₁₂H₁₀N₂O
Phenol, *p*-phenylazo-

C₁₂H₁₀N₂O₂S
3,7-Dibenzothiophenediamine, 5,5-dioxide
Biphenylenesulfone, 3,7-diamino-
Benzidinesulfone

C₁₂H₁₀N₂O₃S
2,5-Cyclohexadiene-Δ^{1,N}-sulfamic acid, 4-phenylimino-
p-Quinone diimine-*N*-sulfonic acid, *N'*-phenyl-

C₁₂H₁₀N₂O₈S₃
4,6-Dibenzothiophenedisulfonic acid,
3,7-diamino-, 5,5-dioxide
4,6-Biphenylenesulfonedisulfonic acid, 3,7-diamino-
Benzidinesulfonedisulfonic acid

C₁₂H₁₀N₄O₄
Benzidine, 2,2'-dinitro-

C₁₂H₁₀O
5-Acenaphthenol

C₁₂H₁₀O₄
2-Naphthoic acid, 3-hydroxy-7-methoxy-

C₁₂H₁₀O₂S
Acetic acid, (2-naphthylmercapto)-

C₁₂H₁₁ClO₃N₂S
Benzenesulfonic acid, 5-amino-2-(*p*-chloroanilino)-
Diphenylamine, 4-amino-4'-chloro-2-sulfo-

C₁₂H₁₁N
2-Biphenylamine
Diphenyl, 2-amino-
4-Biphenylamine
Diphenyl, 4-amino-
Diphenylamine

C₁₂H₁₁NO
Aniline, *o*-phenoxy-
Phenol, *m*-anilino-
Phenol, *p*-anilino-
Phenol, 4,4'-iminodi-
Phenol, *p,p'*-iminodi-

C₁₂H₁₁NO₂
Acetamide, *N*-(7-hydroxy-1-naphthyl)-
7-Naphthol, 1-acetamido-
Glycine, *N*-1-naphthyl-

C₁₂H₁₁NO₂S
Aniline, *o*-(phenylsulfonyl)-

C₁₂H₁₁NO₃S
3-Acenaphthenesulfonic acid, 6-amino-
3-Biphenylsulfonic acid, 4-amino-
Metanilic acid, *N*-phenyl-
Sulfanilic acid, *N*-phenyl-

C₁₂H₁₁NO₄S
Metanilic acid, 6-phenoxy-

C₁₂H₁₁NO₅S
2-Naphthalenesulfonic acid, 4-acetoxy-8-amino-
1-Naphthol-3-sulfonic acid, 6-acetamido-
N-Acetyl-J acid
1-Naphthol-3-sulfonic acid, 7-acetamido-
N-Acetyl-Gamma acid
1-Naphthol-5-sulfonic acid, 8-acetamido-
N-Acetyl-S acid

C₁₂H₁₁NO₆S
Acetic acid, (1-amino-6-sulfo-2-naphthyloxy)-
Glycine, *N*-(5-hydroxy-7-sulfo-2-naphthyl)-
N-Carboxymethyl-J acid

C₁₂H₁₁NO₈S₂
1-Naphthol-3,6-disulfonic acid, 8-acetamido-
N-Acetyl-H acid
1-Naphthol-3,5-disulfonic acid, 8-acetamido-
N-Acetyl-K acid

C₁₂H₁₁NO₉S₂
Glycine, *N*-(8-hydroxy-3,6-disulfo-1-naphthyl)-
N-Carboxymethyl-H acid

C₁₂H₁₁N₃
Aniline, *p*-phenylazo-
Aminoazobenzene
Carbazole, 2,7-diamino-

C₁₄H₁₁N₃O₂
Benzidine, 2-nitro-

C₁₂H₁₁N₃O₃S
Benzenesulfonic acid, *p*-(*p*-aminophenylazo)-

C₁₂H₁₁N₃O₅S
Benzenesulfonic acid, 2-(*p*-aminoanilino)-5-nitro-
Diphenylamine, 4'-amino-4-nitro-2-sulfo-
Benzenesulfonic acid, 2-amino-5-(*p*-nitroanilino)-
Diphenylamine, 4-amino-4'-nitro-3-sulfo-

C₁₂H₁₁N₃O₆S₂
Benzenesulfonic acid, 6-amino-3,4'-azodi-

C₁₂H₁₂N₂
Benzidine
2,2'-Biphenyldiamine
2,4'-Biphenyldiamine
p-Phenylenediamine, *N*-phenyl-
Diphenylamine, *p*-amino-
o-Phenylenediamine, *N*-phenyl-
Diphenylamine, *o*-amino-

C₁₂H₁₂N₂O
Phenol, *p*-(*p*-aminoanilino)-

C₁₂H₁₂N₂O₂
m,m'-Biphenol, 6,6'-diamino-
Benzidine, 3,3-dihydroxy-

C₁₂H₁₂N₂O₂S
Metanilanilide

C₁₂H₁₂N₂O₃
2-Pyrazoline-3-carboxylic acid, 5-oxo-1-phenyl-, ethyl ester
5-Pyrazolone, 3-carbethoxy-1-phenyl-

C₁₂H₁₂N₂O₃S
Benzenesulfonic acid, 5-amino-2-anilino-
Diphenylamine, 4-amino-2-sulfo-
3-Biphenylsulfonic acid, 4,4'-diamino-
Benzidine, 3-sulfo-

C₁₂H₁₂N₂O₄S
Metanilic acid, 6-(*p*-aminophenoxy)-
Diphenylether-2-sulfonic acid, 4,4'-diamino-
2-Naphthalenesulfonic acid,
5(and 8)-acetamido-8(and 5)-amino-

C₁₂H₁₂N₂O₆S
2-Pyrazoline-3-carboxylic acid,
5-oxo-1-(*p*-sulfophenyl)-, ethyl ester
5-Pyrazolone, 3-carbethoxy-1-(*p*-sulfophenyl)-

C₁₂H₁₂N₂O₆S₂
2,2'-Biphenyldisulfonic acid, 4,4'-diamino-
Benzidine-2,2'-disulfonic acid
3,3'-Biphenyldisulfonic acid, 4,4'-diamino-
Benzidine-3,3'-disulfonic acid

C₁₂H₁₂N₂O₆S₃
Metanilic acid, 6,6'-thiodi-
Thioaniline-2,2'-disulfonic acid

C₁₂H₁₂N₂O₇S₂
Metanilic acid, 6,6'-oxydi-
Diphenylether disulfonic acid, 4,4'-diamino-

C₁₂H₁₂N₂S
Aniline, 2,4'-thiodi-
Aniline, 4,4'-thiodi-

C₁₂H₁₂N₄O
Aniline, 3,3'-azoxydi-

C₁₂H₁₂O₆S₂
1-Naphthol-3,6-disulfonic acid, 8-ethoxy-

C₁₂H₁₃N
1-Naphthylamine, *N*-ethyl-
2-Naphthylamine, *N*-ethyl-

C₁₂H₁₃NO
1-Naphthylamine, 2-ethoxy-
Ethanol, 2-(1-naphthylamino)-

C₁₂H₁₃NO₃S
2-Naphthalenesulfonic acid, 7-ethylamino-

C₁₂H₁₃NO₄S
2-Naphthalenesulfonic acid, 5-amino-6-ethoxy-
1-Naphthol-3-sulfonic acid, 7-dimethylamino-
N-Dimethyl-Gamma acid
1-Naphthol-3-sulfonic acid, 7-ethylamino-
N-Ethyl-Gamma acid

C₁₂H₁₃NO₇S₂
1-Naphthol-3-sulfonic acid, 7-(2-sulfoethylamino)-
N-β-Sulfoethyl-Gamma acid

C₁₂H₁₃N₃
2,4,4'-Biphenyltriamine
Diphenylamine, 4,4'-diamino-

C₁₂H₁₃N₃O₃S
Benzenesulfonic acid, 5-amino-2-(*p*-aminoanilino)-
Diphenylamine, 4,4'-diamino-2-sulfo-
Benzenesulfonic acid, 3,5-diamino-4-anilino-
Diphenylamine, 2,6-diamino-4-sulfo-

C₁₂H₁₄CIN
Indoline, 5-chloro-1,3,3-trimethyl-2-methylene-

C₁₂H₁₄CINO₄
Acetoacetanilide, 4'-chloro-2',5'-dimethoxy-

C₁₂H₁₄N₂O₃S
2-Naphthalenesulfonic acid, 7-(2-aminoethylamino)-

C₁₂H₁₄O₄
Phthalic acid, diethyl ester

C₁₂H₁₅N
Indoline, 1,3,3-trimethyl-2-methylene-

C₁₂H₁₅NO₂
2,4-Acetoacetoxylidide
2,5-Acetoacetoxylidide

C₁₂H₁₅NO₃
p-Acetoacetophenetidide

C₁₂H₁₅NO₄
Acetoacetanilide, 2',5'-dimethoxy-

C₁₂H₁₆N₂
Indoline, 5-amino-1,3,3-trimethyl-2-methylene-

C₁₂H₁₆N₂O
Propionitrile, 3-[*N*-(2-hydroxyethyl)-*m*-toluidino]-
Propionitrile, β-(*N*-2-hydroxyethyl-*m*-toluidino)-

C₁₂H₁₆O
Phenol, *p*-cyclohexyl-

C₁₂H₁₇N
Aniline, *p*-cyclohexyl-

C₁₂H₁₈N₂O
Acetanilide, *m*-diethylamino-

C₁₂H₁₈O
Phenol, *p*-isohexyl-

C₁₂H₁₉NO
Ethanol, 2-(*N*-butylanilino)-

C₁₃H₆Cl₃NOS₂
3*H*-Isophenothiazin-3-one, 1,2,4-trichloro-7-methyl-

C₁₃H₈Cl₂O
Benzophenone, 4,4'-dichloro-

C₁₃H₈O₄
3-Dibenzofurancarboxylic acid, 2-hydroxy-

C₁₃H₉Cl₂N₃O
2-Phenazinol, 8-amino-1,3-dichloro-7-methyl-

C₁₃H₉Cl₃
Methane, dichloro(*p*-chlorophenyl)phenyl-

C₁₃H₉NO₂
Naphthalimide, *N*-methyl-

C₁₃H₉NO₃S
3-Biphenylsulfonic acid, 4-cyano-

C₁₃H₉NO₄
4-Biphenylcarboxylic acid, 4'-nitro-

C₁₃H₉N₃O₅
p-Quinone imine, *N*-(4,6-diamino-*m*-tolyl)-

C₁₃H₉N₃O₇
Salicylic acid, 5-(2,4-dinitroanilino)-

C₁₃H₁₀O₂
4-Biphenylcarboxylic acid

C₁₃H₁₀O₆
Benzophenone, 2,3',4,4',6-pentahydroxy-
Maclurin
Fustic extract

C₁₃H₁₁CIN₂O₄S
Benzenesulfonanilide, 4-chloro-*N*-methyl-3-nitro-

C₁₃H₁₁N
2-Fluorenamine

C₁₃H₁₁NO₂
Dibenzofuran, 3-amino-2-methoxy-

C₁₃H₁₁NO₄
Gallanilide

C₁₃H₁₁NO₈S₂
Salicylic acid, 5-(2-amino-4-sulfophenylsulfonyl)-

C₁₃H₁₁N₃O
2-Phenazinol, 8-amino-7-methyl-

C₁₃H₁₁N₃O₃
Benzanilide, 4'-amino-4-nitro-

C₁₃H₁₁N₃O₆S
Benzenesulfonic acid, 2-amino-5-(*m*-nitrobenzamido)-
Benzenesulfonic acid, 2-amino-5-(*p*-nitrobenzamido)-

C₁₃H₁₂CINO
Aniline, 2-benzyloxy-5-chloro-

C₁₃H₁₂N₂O
Phenol, *p*-(*p*-aminobenzylideneamino)-

C₁₃H₁₂N₂O₃
Benzoic acid, *p*-(2,4-diaminophenoxy)-

C₁₃H₁₂N₂O₈S₂
Salicylic acid, 3-(*m*-aminophenylsulfonamido)-5-sulfo-

C₁₃H₁₂N₂S
Carbanilide, thio-
Thiourea, *sym*-diphenyl-

C₁₃H₁₂O₂
Phenol, 4,4'-methylenedi-
Phenol, *p,p'*-methylenedi-

C₁₃H₁₃CIN₂O₆S
2-Pyrazoline-3-carboxylic acid,
1-(6-chloro-4-sulfo-*o*-tolyl)-5-oxo-, ethyl ester
5-Pyrazolone,
3-carbethoxy-1-(6-chloro-4-sulfo-*o*-tolyl)-

C₁₃H₁₃CIN₂O₆S₂
1-Phenol-2-sulfonic acid,
6-(5-amino-*o*-tolylsulfonamido)-4-chloro-

C₁₃H₁₃N
Diphenylamine, *N*-methyl-

C₁₃H₁₃NO
Aniline, *p*-benzyloxy-
Benzo[*h*]quinolin-3-ol, 1,2,3,4-tetrahydro-
Phenol, *m*-(*o*-toluidino)-
Phenol, 3-*o*-toluidino-

C₁₃H₁₃NO₂
Benzo[*h*]quinoline-3,7-diol, 1,2,3,4-tetrahydro-

C₁₃H₁₃NO₃S
o-Anisidine, 5-(phenylsulfonyl)-
Benzenesulfonic acid, *o*-(benzylamino)-

C₁₃H₁₃NO₆S
1-Naphthalenecarbamic acid,
7-hydroxy-3-sulfo-, ethyl ester

C₁₃H₁₃N₃O
Benzanilide, 3,3'-diamino-
Benzanilide, 4,4'-diamino-

C₁₃H₁₃N₃O₂S
Benzenesulfonamide, *p*-(benzylidenedihydrazino)-

C₁₃H₁₃N₃O₅S
Benzenesulfonic acid, 2-(3-amino-*p*-toluidino)-5-nitro-
Diphenylamine,
3'-amino-4'-methyl-4-nitro-2-sulfo-

C₁₃H₁₄N₂
Aniline, 4,4'-methylenedi-
Methane, bis(*p*-aminophenyl)-
Perimidine, 2,3-dihydro-2,2-dimethyl-
Toluene-2,4-diamine, *N*⁴-phenyl-
Diphenylamine, 3-amino-4-methyl-

C₁₃H₁₄N₂O
Phenol, *p*-(4-amino-*m*-toluidino)-
p-Phenylenediamine, *N*-(*o*-methoxyphenyl)-
p-Phenylenediamine, 2-methoxy-*N*⁴-phenyl-

C₁₃H₁₄N₂O₂S
Metanilanilide, *N*¹-methyl-
o-Toluenesulfonanilide, 5-amino-

C₁₃H₁₄N₂O₃S
Benzenesulfonic acid, 5-amino-2-*o*-toluidino-
Diphenylamine, 4-amino-2'-methyl-2-sulfo-

C₁₃H₁₄N₂O₄S
Benzenesulfonic acid, 5-amino-2'-*m*-anisidino-
Benzenesulfonic acid, 5-amino-2-(*m*-methoxyanilino)-
Diphenylamine, 4-amino-3'-methoxy-2-sulfo-

C₁₃H₁₄N₂O₆S₂
5,8-Perimidinedisulfonic acid, 2,3-dihydro-2,2-dimethyl-

C₁₃H₁₄N₄O
Carbanilide, 3,3'-diamino-
Diphenylurea, 3,3'-diamino-
Carbanilide, 4,4'-diamino-
Diphenylurea, 4,4'-diamino-

C₁₃H₁₄N₄O₇S₂
Benzenesulfonic acid, 5,5'-ureylenebis[2-amino-
Diphenylurea, 4,4'-diamino-3,3'-disulfo-

C₁₃H₁₄N₄S
Carbanilide, 4,4'-diaminothio-
Thiourea, *sym*-bis(*p*-aminophenyl)-

C₁₃H₁₅NO
Δ^{3,α}-Indolineacetaldehyde, 1,3,3-trimethyl-

C₁₃H₁₅NO₂
Carbostyryl, 1-butyl-4-hydroxy-
N-*n*-butyl-4-hydroxy-2-quinolone

C₁₃H₁₅N₃O₃S
Benzenesulfonic acid, 5-amino-2-(3-amino-*p*-toluidino)-
Benzenesulfonic acid, 5-amino-2-(4-amino-*m*-toluidino)-

C₁₃H₁₅N₃O₄S
Benzenesulfonic acid, 3,5-diamino-4-*p*-anisidino-
Benzenesulfonic acid, 3,5-diamino-4-(*p*-methoxyanilino)-

C₁₃H₁₈ClNO
Benzaldehyde, *p*-[butyl(2-chloroethyl)amino]-

C₁₃H₁₉N
o-Toluidine, 4-cyclohexyl-

C₁₃H₂₀O₄S
p-Toluenesulfonic acid, 2-butoxyethyl ester

C₁₃H₂₁NO
Ethanol, 2-(*N*-butyl-*m*-toluidino)-

C₁₃H₂₃NCI
Ammonium chloride, [2-(*N*-ethylanilino)ethyl]trimethyl-

C₁₄H₄Br₂N₂O₈
Anthrarufin, 2,6-dibromo-4,8-dinitro-
Anthraquinone, 2,6-dibromo-1,5-dihydroxy-
4,8-dinitro-

C₁₄H₄Cl₂N₂O₈
Anthrarufin, 2,6-dichloro-4,8-dinitro-
Anthraquinone, 2,6-dichloro-1,5-dihydroxy-
4,8-dinitro-

C₁₄H₄Cl₄O₂
Anthraquinone, 1,4,5,8-tetrachloro-

C₁₄H₆Cl₃O₂
Anthraquinone, 1,4,6-trichloro-

C₁₄H₆Br₂O₄
Anthrarufin, 4,8-dibromo-
Anthraquinone, 1,5-dibromo-4,8-dihydroxy-

C₁₄H₆Br₂O₁₀S₂
2,6-Anthraquinonedisulfonic acid,
4,8-dibromo-1,5-dihydroxy-

C₁₄H₆ClNO₄
Anthraquinone, 2-chloro-1-nitro-

C₁₄H₆ClN₆
Chrysazin, 4-chloro-5-nitro-

C₁₄H₆Cl₂O₂
Anthraquinone, 1,4-dichloro-
Anthraquinone, 1,5-dichloro-
Anthraquinone, 1,8-dichloro-
Anthraquinone, 2,6-dichloro-
Anthraquinone, 2,7-dichloro-

C₁₄H₆Cl₂O₄
Anthrarufin, 4,8-dichloro-
Anthraquinone, 1,5-dichloro-4,8-dihydroxy-
Quinizarin, 5,8-dichloro-

C₁₄H₆Cl₂O₅S
2-Anthraquinonesulfonic acid, 5,8-dichloro-

C₁₄H₆Cl₂O₁₀S₂
2,6-Anthraquinonedisulfonic acid,
4,8-dichloro-1,5-dihydroxy-

C₁₄H₆N₂O₆
Anthraquinone, 1,5-dinitro-
Anthraquinone, 1,8-dinitro-

C₁₄H₆N₂O₇
Anthraquinone, 2-hydroxy-1,3-dinitro-

C₁₄H₆N₂O₈
Anthrarufin, 4,8-dinitro-
Anthraquinone, 1,5-dihydroxy-4,8-dinitro-

C₁₄H₆N₂O₁₄S₂
2,6-Anthraquinonedisulfonic acid,
1,5-dihydroxy-4,8-dinitro-
2,6-Anthraquinonedisulfonic acid,
3,7-dihydroxy-4,8-dinitro-

C₁₄H₆N₂O₁₆S₂
2,6-Anthraquinonedisulfonic acid,
1,3,5,7-tetrahydroxy-4,8-dinitro-

C₁₄H₇BrClNO₂
Anthraquinone, 2-amino-1-bromo-3-chloro-

C₁₄H₇BrN₂O
Anthra[1,9]pyrazol-6(2*H*)-one, 3-bromo-

C₁₄H₇BrO₂
Anthraquinone, 1-bromo-

C₁₄H₇BrO₃
Anthraquinone, 1-bromo-4-hydroxy-

C₁₄H₇BrO₄
Quinizarin, 2-bromo-
Anthraquinone, 2-bromo-1,4-dihydroxy-

C₁₄H₇Br₂NO₂
Anthraquinone, 1-amino-2,4-dibromo-
Anthraquinone, 2-amino-1,3-dibromo-

C₁₄H₇ClO₂
Anthraquinone, 1-chloro-
Anthraquinone, 2-chloro-

C₁₄H₇ClO₃
Anthraquinone, 1-chloro-2-hydroxy-
Anthraquinone, 1-chloro-4-hydroxy-

C₁₄H₇ClO₄
Quinizarin, 2-chloro-
Anthraquinone, 2-chloro-1,4-dihydroxy-

C₁₄H₇Cl₂NO₂
Anthraquinone, 2-amino-1,3-dichloro-

C₁₄H₇NO₄
Anthraquinone, 1-nitro-

C₁₄H₇NO₅
Anthraquinone, 1-hydroxy-4-nitro-

C₁₄H₇NO₆
Alizarin, 3-nitro-
Anthraquinone, 1,2-dihydroxy-3-nitro-
Alizarin, 4-nitro-
Anthraquinone, 1,2-dihydroxy-4-nitro-

C₁₄H₇NO₇
Anthrapurpurin, 3-nitro-
Anthraquinone, 1,2,7-trihydroxy-3-nitro-
Flavopurpurin, 3-nitro-
Anthraquinone, 1,2,6-trihydroxy-3-nitro-

C₁₄H₇NO₇S
1-Anthraquinonesulfonic acid, 8-nitro-
2-Anthraquinonesulfonic acid, 5-nitro-

C₁₄H₈BrNO₂

Anthraquinone, 1-amino-2-bromo-
 Anthraquinone, 1-amino-3-bromo-
 Anthraquinone, 1-amino-4-bromo-
 Anthraquinone, 2-amino-3-bromo-

C₁₄H₈BrNO₃

Anthraquinone, 1-amino-2-bromo-4-hydroxy-

C₁₄H₈BrNO₅S

2-Anthraquinonesulfonic acid, 1-amino-4-bromo-

C₁₄H₈Br₂N₂O₂

Anthraquinone, 1,4-diamino-2,3-dibromo-

C₁₄H₈ClNO₂

Anthraquinone, 1-amino-4-chloro-
 Anthraquinone, 1-amino-6-chloro-
 Anthraquinone, 1-amino-7-chloro-
 Anthraquinone, 2-amino-1-chloro-
 Anthraquinone, 2-amino-3-chloro-

C₁₄H₈Cl₂N₂O₂

Anthraquinone, 1,4-diamino-2,3-dichloro-
 Anthraquinone, 2,6-diamino-1,5-dichloro-

C₁₄H₈N₂

3,4-Biphenyldicarbonitrile

C₁₄H₈N₂O

Anthra[1,9]pyrazol-6(2*H*)-one

C₁₄H₈O₂

Anthraquinone
 Phenanthrenequinone

C₁₄H₈O₃

Anthraquinone, 1-hydroxy-
 Anthraquinone, 2-hydroxy-

C₁₄H₈O₄

Alizarin
 Anthraquinone, 1,2-dihydroxy-
 Anthrarufin
 Anthraquinone, 1,5-dihydroxy-
 Chrysazin
 Anthraquinone, 1,8-dihydroxy-
 Quinizarin
 Anthraquinone, 1,4-dihydroxy-
 Xanthopurpurin
 Anthraquinone, 1,3-dihydroxy-

C₁₄H₈O₅

Anthrapurpurin
 Anthraquinone, 1,2,7-trihydroxy-
 Anthraquinone, 1,4,5-trihydroxy-
 Flavopurpurin
 Anthraquinone, 1,2,6-trihydroxy-
 Purpurin
 Anthraquinone, 1,2,4-trihydroxy-

C₁₄H₈O₅S

1-Anthraquinonesulfonic acid
 2-Anthraquinonesulfonic acid

C₁₄H₈O₆

Anthraquinone, 1,3,5,7-tetrahydroxy-
 Anthraquinone, 1,4,5,8-tetrahydroxy-
 Quinalizarin
 Anthraquinone, 1,2,5,8-tetrahydroxy-

C₁₄H₈O₇S

3-Alizarinsulfonic acid
 5-Alizarinsulfonic acid
 2-Anthraquinonesulfonic acid, 5,8-dihydroxy-
 6-Quinizarinsulfonic acid

C₁₄H₈O₈

Anthraquinone, 1,2,4,5,6,8-hexahydroxy-
 1,4,5,8-Naphthalenetetracarboxylic acid

C₁₄H₈O₈S

2-Anthraquinonesulfonic acid, 1,3,4-trihydroxy-
 3-Purpurinsulfonic acid

C₁₄H₈O₈S₂

2,6-Anthraquinonedisulfonic acid
 2,7-Anthraquinonedisulfonic acid

C₁₄H₈O₁₀S₂

2,6-Anthraquinonedisulfonic acid, 1,5-dihydroxy-
 2,6-Anthraquinonedisulfonic acid, 1,8-dihydroxy-

C₁₄H₉NO₂

Anthraquinone, 1-amino-
 Anthraquinone, 2-amino-
 Phenanthrenequinone, 2-amino-

C₁₄H₉NO₂S

Anthraquinone, 2-amino-1-mercapto-

C₁₄H₉NO₃

Anthraquinone, 1-amino-4-hydroxy-
 Anthraquinone, 2-amino-3-hydroxy-

C₁₄H₉NO₄

Alizarin, 3-amino-
 Anthraquinone, 3-amino-1,2-dihydroxy-
 Alizarin, 4-amino-
 Anthraquinone, 4-amino-1,2-dihydroxy-
 Xanthopurpurin, 4-amino-
 Anthraquinone, 1-amino-2,4-dihydroxy-

C₁₄H₉NO₅

Anthraquinone, 1-amino-4,5,8-trihydroxy-
 Flavopurpurin, 3-amino-
 Anthraquinone, 3-amino-1,2,6-trihydroxy-

C₁₄H₉N₃O₄

Anthraquinone, 1,4-diamino-5-nitro-

C₁₄H₁₀

Anthracene

C₁₄H₁₀Cl₂N₄O₂

2-Phenazinol, 7-acetamido-8-amino-1,3-dichloro-

C₁₄H₁₀NO

Pseudoindoxyl, 2-(phenylimino)-
 Isatin-*α*-anilide

C₁₄H₁₀N₂O₂

Anthraquinone, 1,2-diamino-
 Anthraquinone, 1,4-diamino-
 Anthraquinone, 1,5-diamino-
 Anthraquinone, 1,8-diamino-
 Anthraquinone, 2,6-diamino-
 Anthraquinone, 1-hydrazino-

C₁₄H₁₀N₂O₂S₂

Anthraquinone, 2,6-diamino-1,5-dimercapto-

C₁₄H₁₀N₂O₃

Anthraquinone, 1,3-diamino-2-hydroxy-

C₁₄H₁₀N₂O₄

Anthrarufin, 4,8-diamino-
 Anthraquinone, 1,5-diamino-4,8-dihydroxy-

- $C_{14}H_{10}N_2O_5S_2$
6-Benzothiazolecarboxylic acid,
2-(*p*-aminophenyl)-7-sulfo-
- $C_{14}H_{10}N_2O_{10}S_2$
2,6-Anthraquinonedisulfonic acid,
4,8-diamino-1,5-dihydroxy-
2,2'-Stilbenedisulfonic acid, 4,4'-dinitro-
- $C_{14}H_{10}N_2O_{12}S_2$
2,6-Anthrachrysonedisulfonic acid, 4,8-diamino-
- $C_{14}H_{10}O$
1-Anthrol
9-Anthrol
- $C_{14}H_{10}O_2$
1,10-Anthradiol
- $C_{14}H_{11}N$
Benzo[f]quinoline, 3-methyl-
 β -Naphthoquinaldine
- $C_{14}H_{11}N_3O_2$
Anthraquinone, 1,2,4-triamino-
Anthraquinone, 1,4,5-triamino-
- $C_{14}H_{12}N_2O_2$
Carbazole, 9-ethyl-3-nitro-
- $C_{14}H_{12}N_2O_3S_2$
7-Benzothiazolesulfonic acid,
2-(*p*-aminophenyl)-6-methyl-
Dehydrothio-*p*-toluidinesulfonic acid
- $C_{14}H_{12}N_2O_4$
3,3'-Biphenyldicarboxylic acid, 4,4'-diamino-
Benzidine-3,3'-dicarboxylic acid
Salicylic acid, 5-(*m*-aminobenzamido)-
Salicylic acid, 5-(*p*-aminobenzamido)-
- $C_{14}H_{12}N_2O_4S$
2-Naphthalenesulfonic acid,
6-(3-methyl-5-oxo-2-pyrazolin-1-yl)-
5-Pyrazolone, 3-methyl-1-(6-sulfo-2-naphthyl)-
- $C_{14}H_{12}N_2O_6S$
Anthranilic acid, *N*-(2-carboxysulfanilyl)-
- $C_{14}H_{12}N_2O_6S_3$
7-Benzothiazolesulfonic acid,
2-(4-amino-3-sulphophenyl)-6-methyl-
- $C_{14}H_{12}N_2O_7S$
Salicylic acid, 5-(*m*-aminobenzamido)-3-sulfo-
Salicylic acid, 3-(*p*-aminobenzamido)-5-sulfo-
- $C_{14}H_{12}N_2O_7S_2$
1,3-Naphthalenedisulfonic acid,
6-(3-methyl-5-oxo-2-pyrazolin-1-yl)-
5-Pyrazolone, 3-methyl-1-(5,7-disulfo-2-naphthyl)-
1,5-Naphthalenedisulfonic acid,
3-(3-methyl-5-oxo-2-pyrazolin-1-yl)-
5-Pyrazolone, 3-methyl-1-(4,8-disulfo-2-naphthyl)-
- $C_{14}H_{12}N_2O_8S_2$
2,2'-Stilbenedisulfonic acid, 4-amino-4'-nitro-
- $C_{14}H_{12}N_2O_{10}S_2$
2,2'-Bibenzylidisulfonic acid, 4,4'-dinitro-
- $C_{14}H_{12}N_2S$
Benzothiazole, 2-(*p*-aminophenyl)-6-methyl-
Dehydrothio-*p*-toluidine
- $C_{14}H_{12}O_2$
Benzoin
- $C_{14}H_{13}ClN_2O_2$
o-Benzanilide, 4'-amino-5'-chloro-
- $C_{14}H_{13}N$
Carbazole, 9-ethyl-
- $C_{14}H_{13}NO_3S$
Acetic acid, (2-acetamido-1-naphthylmercapto)-
2-Stilbenesulfonic acid, 4-amino-
- $C_{14}H_{14}Cl_2N_2O_2$
Benzidine, 2,2'-dichloro-5,5'-dimethoxy-
- $C_{14}H_{14}N_2$
Carbazole, 3-amino-9-ethyl-
- $C_{14}H_{14}N_2O_2$
p-Anisanilide, 3-amino-
Benzanilide, 4'-amino-3'-methoxy-
- $C_{14}H_{14}N_2O_6S_2$
2,2'-Stilbenedisulfonic acid, 4,4'-diamino-
- $C_{14}H_{14}N_4O_2$
p-Quinone imine, *N*-(5-acetamido-2,4-diaminophenyl)-
- $C_{14}H_{15}N$
Benzylamine, *N*-methyl-*N*-phenyl-
Diphenylamine, *N*-ethyl-
o-Toluidine, *N*-benzyl-
- $C_{14}H_{15}NO_2S$
o-Anisidine, 5-(benzylsulfonyl)-
m-Toluenesulfonic acid, α -(*N*-methylanilino)-
m-Toluenesulfonic acid, α -*o*-toluidino-
- $C_{14}H_{15}N_3$
m-Toluidine, 4-*m*-tolylazo-
m-Aminoazotoluene
o-Toluidine, 4-*o*-tolylazo-
o-Aminoazotoluene
- $C_{14}H_{15}N_3O_3S$
m-Toluenesulfonic acid, 4-(4-amino-*m*-tolylazo)-
- $C_{14}H_{15}N_3O_4S$
Benzenesulfonanilide, 2-amino-*N*-ethyl-5-nitro-
Benzenesulfonic acid, 2-(*p*-acetamidoanilino)-5-amino-
p-Toluenesulfonic acid, 3-amino-5-(*m*-aminobenzamido)-
Benzanilide-5'-sulfonic acid,
3,3'-diamino-2'-methyl-
- $C_{14}H_{16}N_2$
o-Tolidine
m-Tolidine
- $C_{14}H_{16}N_2O$
Benzidine, 3-ethoxy-
Phenol, *p*-(*p*-dimethylaminoanilino)-
- $C_{14}H_{16}N_2O_2$
Benzidine, 3,3'-dimethoxy-
Dianisidine
- $C_{14}H_{16}N_2O_2S$
p-Toluenesulfono-*p*-toluidide, 3-amino-
- $C_{14}H_{16}N_2O_4S$
1-Phenol-2-sulfonic acid, 4-(*p*-dimethylaminoanilino)-
- $C_{14}H_{16}N_2O_6S_2$
2,2'-Bibenzylidisulfonic acid, 4,4'-diamino-
2,2'-Biphenyldisulfonic acid, 4,4'-diamino-5,5'-dimethyl-
3,3'-Tolidine-6,6'-disulfonic acid
- $C_{14}H_{16}N_2O_8S_2$
2,2'-Biphenyldisulfonic acid, 4,4'-diamino-5,5'-dimethoxy-
- $C_{14}H_{16}N_4O$
o-Toluidine, 5,5'-azoxydi-
- $C_{14}H_{17}N$
5-Indolinecarboxylic acid, 1,3,3-trimethyl-
2-methylene-, methyl ester

C₁₄H₁₇NO₂
Δ²-α-Indolineacetaldehyde, 5-methoxy-1,3,3-trimethyl-

C₁₄H₁₇N₃
Di-*o*-tolylamine, 4,4'-diamino-
Di-*m*-tolylamine, 4,4'-diamino-

C₁₄H₁₇N₃O₂S
Benzenesulfonanilide, 2,5-diamino-*N*-ethyl-

C₁₄H₂₀N₂O
Acetanilide, *p*-amino-*N*-cyclohexyl-

C₁₄H₂₁NO
3-Quinolinol, 1-*sec*-butyl-1,2,3,4-tetrahydro-7-methyl-

C₁₄H₂₃NO₂
Ethanol, 2-(*N*-butyl-6-methoxy-*m*-toluidino)-

C₁₅H₆BrNO₂
1-Anthraquinonecarbonitrile, 2-bromo-

C₁₅H₆Br₂N₂O
7*H*-Dibenzo[*de,h*]quinazolin-7-one, 4,6-dibromo-
1,9-Anthrapyrimidine, 2,4-dibromo-

C₁₅H₆ClNO₅
2-Anthraquinonecarbonyl chloride, 1-nitro-

C₁₅H₇ClO₃
2-Anthraquinonecarbonyl chloride

C₁₅H₇ClO₄
2-Anthraquinonecarboxylic acid, 1-chloro-
2-Anthraquinonecarboxylic acid, 3-chloro-

C₁₅H₇NO₆
2-Anthraquinonecarboxylic acid, 1-nitro-

C₁₅H₈BrNO₄
2-Anthraquinonecarboxylic acid, 1-amino-4-bromo-

C₁₅H₈ClNO₃
2-Anthraquinonecarbonyl chloride
2-Anthraquinonecarbonyl chloride, 1-amino-
2-Anthraquinonecarbonyl chloride, 4-amino-

C₁₅H₈Cl₂O₂
Anthraquinone, 1-chloro-2-(chloromethyl)-

C₁₅H₈N₂O₆
2-Anthraquinonecarboxylic acid, 1-amino-4-nitro-

C₁₅H₈O₃
2-Anthraquinonecarboxaldehyde

C₁₅H₈O₆
3-Alizarincarboxylic acid
2-Anthraquinonecarboxylic acid, 1,4-dihydroxy-
2-Quinizarincarboxylic acid

C₁₅H₉ClO
Anthrone, 1-chloro-
Anthrone, 2-chloro-

C₁₅H₉ClO₂
Anthraquinone, 2-(chloromethyl)-

C₁₅H₉NO₃
2-Anthraquinonecarboxaldehyde, 1-amino-

C₁₅H₉NO₄
Anthraquinone, 2-methyl-1-nitro-
2-Anthraquinonecarboxylic acid, 1-amino-
2-Anthraquinonecarboxylic acid, 3-amino-

C₁₅H₁₀BrNO₂
Anthraquinone, 1-amino-4-bromo-2-methyl-
Anthraquinone, 1-bromo-4-methylamino-
Anthraquinone, 2-bromo-1-methylamino-

C₁₅H₁₀CINOS
3(2*H*)-Thianaphthenone,
6-chloro-4-methyl-2-phenylimino-
Thioindoxyl-*a*-anilide, 6-chloro-4-methyl-

C₁₅H₁₀O₂
Anthraquinone, 2-methyl-

C₁₅H₁₀O₃
Anthraquinone, 1-methoxy-

C₁₅H₁₀O₆
2,4,5-Biphenyltricarboxylic acid

C₁₅H₁₁NO₂
Anthraquinone, 1-amino-2-methyl-
Anthraquinone, 1-methylamino-

C₁₅H₁₁NO₃
Anthraquinone, 1-amino-4-methoxy-

C₁₅H₁₂N₂O₄S
Benzenesulfonic acid, *o*-(5-oxo-3-phenyl-2-pyrazolin-1-yl)-
5-Pyrazolone, 3-phenyl-1-(*o*-sulfophenyl)-

C₁₅H₁₂N₂O₅S
2-Anthraquinonesulfonic acid, 1-amino-4-methylamino-

C₁₅H₁₃N
Indole, 1-methyl-2-phenyl-

C₁₅H₁₃NO₃
p-Toluic acid, 5-amino-2-benzoyl-

C₁₅H₁₄N₂O₄
2,3-Cresotic acid, 5-(*p*-aminobenzamido)-
Salicylic acid, 5-(3-amino-4-methylbenzamido)-
Salicylic acid, 5-(4-amino-3-methylbenzamido)-

C₁₅H₁₄N₄O₅
Anthranelic acid, 5,5'-ureylenedi-
Diphenylurea-3,3'-dicarboxylic acid, 4,4'-diamino-

C₁₅H₁₅Cl₂N
p-Toluidine, α,α-dichloro-*N,N*-dimethyl-α-phenyl-
4-Dimethylaminobenzophenone dichloride

C₁₅H₁₅NO₆S
Salicylic acid, 5-(3-amino-4-methoxybenzylsulfonfyl)-

C₁₅H₁₅N₃O
2(10*H*)-Phenazinone, 8-amino-10-ethyl-7-methyl-

C₁₅H₁₆N₂O
Benzanilide, 4'-amino-*N*-ethyl-
2,4-Benzoxylidide, 5'-amino-
Benzylamine, *N*-ethyl-*N*-(*p*-nitrosophenyl)-

C₁₅H₁₆N₂O₂
m-Benzanisidide, 4'-amino-6'-methyl-

C₁₅H₁₆N₂O₃S
Acetanilide, 4'-amino-3'-(*p*-tolylsulfonfyl)-

C₁₅H₁₇N
Benzylamine, *N*-ethyl-*N*-phenyl-

C₁₅H₁₇NO
m-Phenetidine, *N*-*p*-tolyl-

C₁₅H₁₇NO₃S
m-Toluenesulfonic acid, α-(*N*-ethylanilino)-
p-Toluenesulfonic acid, α-(*N*-ethylanilino)-

C₁₅H₁₇NO₆S₂
Metanilic acid, *N*-ethyl-*N*-(*m*-sulfobenzyl)-

C₁₅H₁₇N₃
Acridan, 3,6-diamino-2,7-dimethyl-
p-Toluidine, *N*-ethyl-2-phenylazo-



Aniline, 4,4'-isopropylidenedi-
Aniline, *p,p'*-isopropylidenedi-
p-Phenylenediamine, *N*-benzyl-*N*-ethyl-
m-Toluidine, 4,4'-methylenedi-
Methane, bis(4-amino-*o*-tolyl)-
o-Toluidine, 4,4'-methylenedi-



Benzenesulfonic acid,
5,5'-ureylenebis[2-amino-4-methoxy-
Diphenylurea-3,3'-disulfonic acid,
4,4'-diamino-6,6'-dimethoxy-



Toluene-2,4-diamine, 5,5'-methylenedi-



1,6-Pyrenedione, 3,5,8,10-tetrachloro-



Indigotin, 5,5'-dichloro-



1,2-Aceanthredione



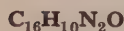
Naphtho[2,3-*f*]quinoxaline-7,12-dione, 2,3-dihydroxy-
Anthraquinone, 1,2-(dihydroxypyrazino)-



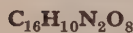
2-Anthraquinonecarboxylic acid, 1-chloro-, methyl ester



Pyrene



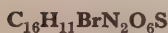
Benzo[*a*]phenazin-5-ol



Anthraquinone, 1,5-dimethoxy-4,8-dinitro-



1,3,6,8-Pyrenetetrasulfonic acid



2-Anthraquinonesulfonic acid,
5-acetamido-1-amino-4-bromo-



5*H*-Benzo[*b*]carbazole
1-Pyrenamine



Anthraquinone, 1-acetamido-
Anthraquinone, 2-acetamido-



7*H*-Benzo[*c*]carbazole-2-sulfonic acid, 4-hydroxy-



Indigotin, 6,6'-diamino-
p-Quinone imine, *N*-(4-amino-8-hydroxy-1-naphthyl)-



Anthraquinone, 1,5-dimethoxy-
Anthraquinone, 1,8-dimethoxy-



1-Naphthylamine, *N*-phenyl-
2-Naphthylamine, *N*-phenyl-



3-Indolecarboxaldehyde, 1-methyl-2-phenyl-
Phenol, *p*-(2-naphthylamino)-



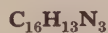
1-Naphthalenesulfonic acid, 8-anilino-
Phenyl-Peri acid



1-Naphthol-3-sulfonic acid, 6-anilino-
N-Phenyl-*J* acid
2-Phenylamino-5-naphthol-7-sulfonic acid
1-Naphthol-3-sulfonic acid, 7-anilino-
N-Phenyl-*Gamma* acid
2-Phenylamino-8-naphthol-6-sulfonic acid
2-Naphthol-6-sulfonic acid, 8-anilino-



1-Naphthol-3,6-disulfonic acid, 8-phenylsulfonamido-
N-Phenylsulfonyl-*H* acid
1-Naphthol-3,6-disulfonic acid,
8-amino-, benzenesulfonate
H acid, benzenesulfonic acid ester



1-Naphthylamine, 4-phenylazo-



Phenol, *p*-(4-amino-1-naphthylamino)-



Anthraquinone, 1,5-diamino-4,8-dimethoxy-



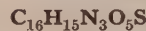
2-Naphthalenesulfonic acid, 5(and 8)-amino-8
(and 5)-*p*-hydroxyanilino-
2-Naphthalenesulfonic acid, 6-(2,4-diaminophenoxy)-



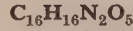
4',4'''-Biacetanilide, 2',2'''-dinitro-



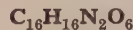
5-Pyrazolone, 1-(4'-amino-4-biphenyl)-3-methyl-



Benzenesulfonic acid, *p*-(*p*-acetoacetamidophenylazo)-
Benzenesulfonic acid, *p*-[*p*-(*α*-acetylacetamido)phenylazo]-



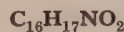
Oxanilic acid, 4'-(4-amino-3-methoxyphenyl)-2'-methoxy-



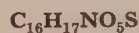
Acetic acid, (4,4'-diamino-3,3'-biphenylenedioxy)di-
Benzidine-3,3'-diglycolic acid



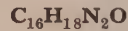
Benzothiazole, 2-(4-amino-*m*-tolyl)-4,6-dimethyl-
Benzothiazole, 2-(6-amino-*m*-tolyl)-4,6-dimethyl-



Benzaldehyde, *p*-(*N*-methyl-*p*-phenetidine)-



Salicylic acid, 5-(5-amino-2,4-dimethylbenzylsulfonyl)-



m-Benzotoluidide, 4'-amino-*N*-ethyl-
p-Tolu-2,4-xylylide, 3-amino-



Acetic acid, terephthaloyldi-, diethyl ester



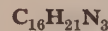
m-Toluidine, *N*-benzyl-*N*-ethyl-



m-Toluenesulfonic acid, *α*-(*N*-ethyl-*m*-toluidino)-



Aniline, *N,N*-diethyl-*p*-phenylazo-
2,4-Xylidine, 6-(2,4-xylylazo)-



Diphenylamine, 4,4'-bis(dimethylamino)-



Palmitic acid



Benzanthrone, 3,9-dibromo-



Benzanthrone, 3-bromo-

C₁₇H₉ClO
Benzanthrone, 3-chloro-

C₁₇H₁₀BrNO₂
7*H*-Dibenz[*f,i*]isoquinoline-2,7(3*H*)-dione,
6-bromo-3-methyl-

C₁₇H₁₀ClNO₂
7*H*-Dibenz[*f,i*]isoquinoline-2,7(3*H*)-dione,
6-chloro-3-methyl-

C₁₇H₁₀O
Benzanthrone

C₁₇H₁₀OS
Benzanthrone, 3-mercapto-

C₁₇H₁₁Cl₂NO₈S₂
1-Naphthol-3,5-disulfonic acid, 8-(2,4-dichlorobenzamido)-
2,4-Dichlorobenzoyl-K acid
1-Naphthol-3,5-disulfonic acid, 8-(2,5-dichlorobenzamido)-
2,5-Dichlorobenzoyl-K acid

C₁₇H₁₁NO₂
11*H*-Benzo[*a*]carbazole-3,4-dione, 10-methyl-

C₁₇H₁₂BrNO₃
Anthraquinone, 1-bromo-4-(*N*-methylacetamido)-

C₁₇H₁₂ClNO₂
2-Naphthanilide, 4'-chloro-3-hydroxy-

C₁₇H₁₂N₂O₄
2-Naphthanilide, 3-hydroxy-3'-nitro-

C₁₇H₁₂N₂O₄S₂
Naphtho[2,1]thiazole-8-sulfonic acid,
2-(*m*-aminophenyl)-6-hydroxy-
Naphtho[2,1]thiazole-8-sulfonic acid,
2-(*p*-aminophenyl)-6-hydroxy-

C₁₇H₁₂N₂O₇S
1-Naphthol-3-sulfonic acid, 6-(*m*-nitrobenzamido)-
1-Naphthol-3-sulfonic acid, 6-(*p*-nitrobenzamido)-

C₁₇H₁₂N₄O₆
2-Pyrazoline-3-carboxylic acid,
1-[*m*-(*m*-aminobenzamido)phenyl]-5-oxo-
5-Pyrazolone-3-carboxylic acid,
1-[*m*-(*m*-aminobenzamido)phenyl]-

C₁₇H₁₃NO₂
Benzamide, *N*-(7-hydroxy-1-naphthyl)-
7-Naphthol, 1-benzamido-
2-Naphthanilide, 3-hydroxy-
2-Hydroxy-3-naphthanilide

C₁₇H₁₃NO₅S
Anthranelic acid, *N*-(6-hydroxy-2-naphthylsulfonyl)-
1-Naphthol-3-sulfonic acid, 6-benzamido-
N-Benzoyl-J acid
1-Naphthol-5-sulfonic acid, 8-benzamido-
N-Benzoyl-S acid

C₁₇H₁₃NO₆S
Benzoic acid, *m*-(5-hydroxy-7-sulfo-2-naphthylamino)-
N-*m*-Carboxyphenyl-J acid
Benzoic acid, *p*-(8-hydroxy-6-sulfo-2-naphthylamino)-
N-*p*-Carboxyphenyl-Gamma acid

C₁₇H₁₃NO₇S
Salicylic acid, 5-(5-hydroxy-7-sulfo-2-naphthylamino)-
N-(3-Carboxy-4-hydroxyphenyl)-J acid

C₁₇H₁₃NO₈S₂
1-Naphthol-3,5-disulfonic acid, 8-benzamido-
N-Benzoyl-K acid
1-Naphthol-3,6-disulfonic acid, 8-benzamido-
N-Benzoyl-H acid

C₁₇H₁₃N₃O
Phenol, *p*-(6(or 7)-perimidylamino)-

C₁₇H₁₃N₃O₄S
1*H*-Naphth[1,2]imidazole-7-sulfonic acid,
2-(*m*-aminophenyl)-4-hydroxy-
1*H*-Naphth[1,2]imidazole-8-sulfonic acid,
2-(*m*-aminophenyl)-6-hydroxy-

C₁₇H₁₄N₂O₅S
1-Naphthol-3-sulfonic acid, 6-(*m*-aminobenzamido)-
m-Aminobenzoyl-J acid
1-Naphthol-3-sulfonic acid, 6-(*p*-aminobenzamido)-
p-Aminobenzoyl-J acid
1-Naphthol-3-sulfonic acid, 7-(*p*-aminobenzamido)-
p-Aminobenzoyl-Gamma acid

C₁₇H₁₄N₂O₈S₂
1-Naphthol-3,6-disulfonic acid, 8-(*p*-aminobenzamido)-
N-(*p*-Aminobenzoyl)-H acid

C₁₇H₁₄N₂O₉S₂
Salicylic acid, 5-[2-(3-methyl-5-oxo-
2-pyrazolin-1-yl)-4-sulfophenylsulfonyl]-
5-Pyrazolone, 1-[2-(3-carboxy-4-hydroxy-
phenylsulfonyl)-5-sulfophenyl]-3-methyl-

C₁₇H₁₅N
1-Naphthylamine, *N*-benzyl-
2-Naphthylamine, *N*-*p*-tolyl-
2-Naphthylamine, *N*-methyl-*N*-phenyl-

C₁₇H₁₅NO₃S
1-Naphthalenesulfonic acid, 8-*p*-toluidino-
N-*p*-Tolyl-Peri acid

C₁₇H₁₅NO₄S
1-Naphthol-3-sulfonic acid, 6-*p*-toluidino-
p-Tolyl-J acid
1-Naphthol-5-sulfonic acid, 8-*p*-toluidino-
p-Tolyl-S acid

C₁₇H₁₅NO₅S
1-Naphthol-3-sulfonic acid, 7-*p*-anisidino-
1-Naphthol-3-sulfonic acid, 7-(*p*-methoxyanilino)-
p-Anisyl-Gamma acid
1-Naphthol-3-sulfonic acid, 6-*p*-anisidino-
1-Naphthol-3-sulfonic acid, 6-(*p*-methoxyanilino)-
p-Anisyl-J acid

C₁₇H₁₅NO₆S₂
1-Naphthol-5-sulfonic acid, 8-*p*-tolylsulfonamido-
N-*p*-Tosyl-S acid

C₁₇H₁₅NO₉S₃
1-Naphthol-3,6-disulfonic acid,
8-amino-, *p*-toluenesulfonate
O-*p*-Tosyl-H acid
1-Naphthol-3,6-disulfonic acid, 8-*p*-tolylsulfonamido-
N-*p*-Tosyl-H acid

C₁₇H₁₅N₃O₅S
Anthranelic acid, *N*-[*m*-(3-methyl-5-oxo-
2-pyrazolin-1-yl)phenylsulfonyl]-
5-Pyrazolone, 1-[*m*-(*o*-carboxyphenyl-
sulfamoyl)phenyl]-3-methyl-

C₁₇H₁₆ClNO₉S₃
1-Naphthol-3,6-disulfonic acid,
8-(4-chloro-2,5-xylylsulfonamido)-
N-(4-Chloro-2,5-xylenesulfonyl)-H acid

C₁₇H₁₆N₂O₅S₂
1-Naphthalenesulfonic acid,
5-(5-amino-*o*-tolylsulfonamido)-

C₁₇H₁₉NO₂
o-Toluic acid, α -(4-amino-*m*-tolyl)-, ethyl ester

C₁₇H₂₀Cl₂N₂
Aniline, 4,4'-(dichloromethylene)bis[*N,N*-dimethyl-
Aniline, *p,p'*-(dichloromethylene)bis[*N,N*-dimethyl-

C₁₇H₂₀N₂O
Benzophenone, 4,4'-bis(dimethylamino)-

C₁₇H₂₀N₂O₃
Benzanilide, 4'-amino-2',5'-diethoxy-

C₁₇H₂₂N₂
Aniline, 4,4'-methylenebis[*N,N*-dimethyl-
Aniline, *p,p'*-methylenebis[*N,N*-dimethyl-
o-Toluidine, 4,4'-methylenebis[*N*-methyl-
2,5-Xylidine, 4,4'-methylenedi-
Diphenylmethane,
4,4'-diamino-2,2',5,5'-tetramethyl-

C₁₇H₂₂N₂O
Benzhydrol, 3,3'-dimethyl-4,4'-bis(methylamino)-
Benzhydrol, 4,4'-bis(dimethylamino)-

C₁₇H₂₂N₂O₄S
o-Toluenesulfonic acid, 5-dimethylamino-
α-(*p*-dimethylaminophenyl)-*α*-hydroxy-

C₁₇H₂₄N₂O₆
p-Acetanilide, 3'-bis(2-acetoxyethyl)amino-

C₁₇H₂₉NO
Aniline, 2-isopropoxy-5-(1,1,3,3-tetramethylbutyl)-

C₁₈H₁₀Cl₄N₂O₂
p-Quinone, 2,5-dichloro-3,6-bis(*p*-chloroanilino)-

C₁₈H₁₁Br₂N₃O
2(10*H*)-Phenazinone, 8-aminodibromo-10-phenyl-

C₁₈H₁₂Cl₂N₂O₂
p-Quinone, 2,5-dianilino-3,6-dichloro-

C₁₈H₁₂O
Benzanthrone, 4-methyl-

C₁₈H₁₂O₂
Benzanthrone, 2-methoxy-

C₁₈H₁₂O₂S₂
Thioindigo, 4,4'-dimethyl-

C₁₈H₁₃N₃O
2(10*H*)-Phenazinone, 8-amino-10-phenyl-

C₁₈H₁₄ClNO₂
2-Naphtho-*o*-toluidide, 4'-chloro-3-hydroxy-
2-Naphtho-*o*-toluidide, 5'-chloro-3-hydroxy-

C₁₈H₁₄N₂O
Phenol, *p*-(3-carbazolylamino)-
p-Quinone imine, *N*-(*p*-anilinophenyl)-

C₁₈H₁₄N₂O₄
Anthraquinone, 1,4-diacetamido-
Anthraquinone, 1,6-diacetamido-
Anthraquinone, 1,7-diacetamido-

C₁₈H₁₄N₄O₆
Phenol, 4,4'-(4,6-dinitro-*m*-phenylenediimino)di-
Phenol, *p*,*p*'-(4,6-dinitro-*m*-phenylenediimino)di-

C₁₈H₁₅CIN₄
Phenazinium chloride, 3,7-diamino-5-phenyl-
Phenosafuranine

C₁₈H₁₅NO₂
2-Naphtho-*o*-toluidide, 3-hydroxy-
2-Hydroxy-3-naphthoic-*o*-toluidide
2-Naphtho-*p*-toluidide, 3-hydroxy-
2-Hydroxy-3-naphthoic-*p*-toluidide

C₁₈H₁₅NO₃
2-Naphthanilide, 3-hydroxy-7-methoxy-
2-Naphtho-*o*-aniside, 3-hydroxy-
2-Naphtho-*p*-aniside, 3-hydroxy-

C₁₈H₁₅NO₉S₂
Salicylic acid, 5-[*N*-(5-hydroxy-
7-sulfo-2-naphthyl)-*N*-methylsulfamoyl]-
N-(3-Carboxy-4-hydroxyphenylsulfonyl)-
N-methyl-J acid
Salicylic acid, 5-[*N*-(8-hydroxy-
6-sulfo-2-naphthyl)-*N*-methylsulfamoyl]-
N-(3-Carboxy-4-hydroxyphenylsulfonyl)-
N-methyl-Gamma acid

C₁₈H₁₅NO₁₂S₃
Salicylic acid, 5-[*N*-(8-hydroxy-
3,6-disulfo-1-naphthyl)-*N*-methylsulfamoyl]-
N-Methyl-*N*-(3-carboxy-4-hydroxyphenylsulfonyl)-
H acid

C₁₈H₁₅N₃O
Phenol, *p*-(2-methyl-6(or 7)-perimidylamino)-

C₁₈H₁₅N₃O₄S₂
7-Benzothiazolesulfonic acid, 6-methyl-2-[*p*-(3-methyl-
5-oxo-2-pyrazolin-1-yl)phenyl]-
5-Pyrazolone, 3-methyl-1-[*p*-(6-methyl-7-sulfo-2-
benzothiazolyl)phenyl]-

C₁₈H₁₆N₂
m-Phenylenediamine, *N*,*N*'-diphenyl-

C₁₈H₁₆N₂O₄S
Sulfanilic acid, *N*-[*p*-(*p*-hydroxyanilino)phenyl]-

C₁₈H₁₆N₂O₅S
1-Naphthol-3-sulfonic acid, 6-(4-amino-3-
methylbenzamido)-
N-(4-Amino-3-toluoyl)-J acid

C₁₈H₁₆N₂O₅S₂
7-Benzothiazolesulfonic acid,
2-(*p*-acetoacetamidophenyl)-6-methyl-
7-Benzothiazolesulfonic acid,
2-(*p*-*α*-acetylacetamidophenyl)-6-methyl-

C₁₈H₁₇N
2-Naphthylamine, *N*-2,6-xylyl-

C₁₈H₁₇NO
1-Naphthylamine, *N*-(*p*-ethoxyphenyl)-
1-Naphthylamine, *N*-*p*-phenetyl-

C₁₈H₁₇NO₆S
1-Naphthol-3-sulfonic acid, 6-(2,4-dimethoxyanilino)-
2',4'-Dimethoxyphenyl-J acid

C₁₈H₁₉NO₄
Benzoic acid, *o*-(4-diethylamino-2-hydroxybenzoyl)-

C₁₈H₂₂N₂
Aniline, 4,4'-cyclohexyldenedi-

C₁₈H₂₂N₃O₄S
o-Benzanilide, 4'-amino-5'-diethylsulfamoyl-

C₁₈H₃₁N
Aniline, *p*-dodecyl-

C₁₈H₃₅ClO
Stearoyl chloride

C₁₈H₃₉N
Octadecylamine

C₁₉H₈Cl₃N₃O₅
3*H*-Isophenoxazin-3-one,
1,2,4-trichloro-7-(*m*-nitrobenzamido)-

C₁₉H₁₃CIN₂O₂
1-Carbazolecarboxanilide, 4'-chloro-2-hydroxy-

C₁₉H₁₄CIN₃O
2(10*H*)-Phenazinone,
8-amino-1-chloro-7-methyl-10-phenyl-

C₁₉H₁₆CINO₃
2-Naphtho-*o*-aniside, 3-hydroxy-4'-chloro-5'-methyl-

C₁₉H₁₆CINO₄
2-Naphthanilide, 5'-chloro-3-hydroxy-2',4'-dimethoxy-
2-Naphthanilide, 4'-chloro-3-hydroxy-2',5'-dimethoxy-

C₁₉H₁₆N₂O₃
Anthranilic acid, *N*-[*p*-(*p*-hydroxyanilino)phenyl]-

C₁₉H₁₆N₄O₆S₂
Benzimidazole, 5-amino-1-anilino-2-phenyl-, disulfonated

C₁₉H₁₆N₄O₉S₃
Benzimidazole, 5-amino-1-anilino-2-phenyl-, trisulfonated

C₁₉H₁₇NO₂
2-Naphtho-2,3-xylylide, 3-hydroxy-
2-Naphtho-2,4-xylylide, 3-hydroxy-

C₁₉H₁₇NO₃
2-Naphtho-*p*-aniside, 3-hydroxy-2'-methyl-
2-Naphtho-*o*-phenetide, 3-hydroxy-
2-Naphtho-*o*-toluidide, 3-hydroxy-7-methoxy-

C₁₉H₁₇NO₄
2-Naphthanilide, 3-hydroxy-2',5'-dimethoxy-

C₁₉H₁₇N₃O₆S
1-Naphthol-3-sulfonic acid, 6-(*p*-acetamidophenylureido)-

C₁₉H₁₈N₂
Aniline, 4,4'-benzylidenedi-
Triphenylmethane, 4,4'-diamino-

C₁₉H₁₈N₂O
Benzamide, *p*-amino-*N*-ethyl-*N*-1-naphthyl-
1-Naphthylamine, *N*-(*p*-aminobenzoyl)-*N*-ethyl-

C₂₀H₈Cl₄O₃
Fluoran, 3',4,6',7-tetrachloro-

C₂₀H₈Cl₄O₅
Fluorescein, 4,5,6,7-tetrachloro-

C₂₀H₁₀Cl₂O₃
Fluoran, 3',6'-dichloro-

C₂₀H₁₀Cl₂O₅
Fluorescein, 4,7-dichloro-

C₂₀H₁₃BrN₂O₂
Anthraquinone, 1-amino-4-anilino-2-bromo-

C₂₀H₁₄N₄O₉S
Benzenesulfonic acid, 2,5-bis(*p*-nitrobenzamido)-

C₂₀H₁₅N
1-Naphthylamine, *N*-2-naphthyl-

C₂₀H₁₅NO₈S₂
1-Naphthol-3-sulfonic acid, 6,6'-iminobis-
Di-J acid

C₂₀H₁₅NO₁₀S₃
1-Naphthol-3,5-disulfonic acid,
8-(6-hydroxy-2-naphthylsulfonamido)-
N-(6-Hydroxy-2-naphthylsulfonyl)-K acid

C₂₀H₁₅N₃O₅S
2-Anthraquinonesulfonic acid,
1-amino-4-(*p*-aminoanilino)-

C₂₀H₁₇N₃O₂
p-Quinone imine, *N*-(*p*-[*p*-acetamidoanilino]phenyl)-

C₂₀H₁₇N₃O₉S₂
Salicylic acid, 5-[*m*-(4-amino-3-sulfophenylcarbamoyl)-
phenylsulfamoyl]-

C₂₀H₁₈ClNO₅
2-Naphthanilide, 4'-chloro-3-hydroxy-2',5',7-trimethoxy-

C₂₀H₁₈N₂O
Phenol, *p*-(9-ethyl-3-carbazolylamino)-

C₂₀H₁₉ClN₄
Phenazinium chloride, 3,7-diamino-2,8-dimethyl-5-phenyl-

C₂₀H₁₉N
Dibenzylamine, *N*-phenyl-

C₂₀H₁₉NO₃S
m-Toluenesulfonic acid, α -(*N*-benzylanilino)-

C₂₀H₁₉NO₆S₂
m(and *p*)-Toluenesulfonic acid, α,α' -phenyliminodi-
Dibenzylanilinedisulfonic acid

C₂₀H₂₀N₂
m-Phenylenediamine, *N,N'*-di-*o*-tolyl-
m-Phenylenediamine, *N,N'*-di-*p*-tolyl-

C₂₀H₂₂CIN
Indole, 2-(*p*-chlorophenyl)-1-isobutyl-4,6-dimethyl-

C₂₀H₂₆N₂
o-Toluidine, 4,4'-cyclohexylidenedi-

C₂₀H₂₆N₂O₂
o-Anisidine, 4,4'-cyclohexylidenedi-

C₂₀H₂₇NO
Aniline, *o*-[*p*-(1,1,3,3-tetramethylbutyl)phenoxy]-

C₂₁H₇Cl₄NO₃
Naphth[2,3-*c*]acridan-5,8,14-trione,
6,7,9,12-tetrachloro-

C₂₁H₈Cl₃NO₃
Naphth[2,3-*c*]acridan-5,8,14-trione,
6,10,12-trichloro-

C₂₁H₉Cl₂NO₃
Naphth[2,3-*c*]acridan-5,8,14-trione, 9,12-dichloro-

C₂₁H₁₁CIN₂O₃
Naphth[2,3-*c*]acridan-5,8,14-trione,
6-amino-10-chloro-

C₂₁H₁₁NO₃
Naphth[2,3-*c*]acridan-5,8,14-trione
1,2-Phthaloylacridone

C₂₁H₁₂BrN₃O₂
1*H*-Anthra[1,2]triazole-6,11-dione, 4-bromo-1-*p*-tolyl-
1,2-Triazoloanthraquinone, 3-bromo-1-*p*-tolyl-

C₂₁H₁₂ClNO₃
Anthraquinone, 1-benzamido-4-chloro-
Anthraquinone, 1-benzamido-5-chloro-

C₂₁H₁₄N₂O₃
Anthraquinone, 1-amino-4-benzamido-
Anthraquinone, 1-amino-5-benzamido-

C₂₁H₁₅NO₂
2-Naphthamide, 3-hydroxy-*N*-1-naphthyl-
2-Hydroxy-3-naphthoic- α -naphthylamide
2-Naphthamide, 3-hydroxy-*N*-2-naphthyl-
2-Hydroxy-3-naphthoic- β -naphthylamide

C₂₁H₁₅N₃O₃S₃
7-Benzothiazolesulfonic acid, 2-[2-(*p*-aminophenyl)-6-
benzothiazolyl]-6-methyl-
Primuline

C₂₁H₁₆N₂O₉S₂
1-Naphthol-3-sulfonic acid, 6,6'-ureylenebis-
Carbonyl J acid
J acid urea

C₂₁H₁₇NO₅
3-Dibenzofurancarboxanilide, 2-hydroxy-2',5'-dimethoxy-

C₂₁H₁₇N₃O₂
Anthraquinone, 1-*p*-aminoanilino-4-methylamino-

C₂₁H₂₀Cl₂N₂O₂
o-Anisidine, 4,4'-benzylidenebis[5-chloro-
Triphenylmethane,
4,4'-diamino-2,2'-dichloro-5,5'-dimethoxy-

C₂₁H₂₀N₂O
o-Benzotoluidide, 4'-(4-amino-*m*-tolyl)-
o-Tolidine, monobenzoyl-

C₂₁H₂₂N₂O₂
o-Anisidine, 4,4'-benzylidenedi-
Triphenylmethane, 4,4'-diamino-3,3'-dimethoxy-

C₂₁H₂₂N₄O₄S
Benzenesulfonic acid,
3,5-diamino-4-[*p*-(*N*-ethylbenzamido)anilino]-

C₂₁H₂₈Cl₂N₂
Aniline, 4,4'-(dichloromethylene)bis[*N,N*-diethyl-
Aniline, *p,p'*-(dichloromethylene)bis[*N,N*-diethyl-

C₂₁H₂₈N₂O
Benzophenone, 4,4'-bis(diethylamino)-

$C_{21}H_{30}N_2$
 Aniline, 4,4'-methylenebis[*N,N*-diethyl-
 Aniline, *p,p'*-methylenebis[*N,N*-diethyl-
 $C_{21}H_{30}N_2O$
 Benzhydrol, 4,4'-bis(diethylamino)-
 $C_{22}H_8Br_2O_2$
 Dibenzo[*cd,jk*]pyrene-6,12-dione, 4,10-dibromo-
 Anthanthrone, 4,10-dibromo-
 $C_{22}H_{10}O_2$
 Dibenzo[*cd,jk*]pyrene-6,12-dione
 Anthanthrone
 $C_{22}H_{12}N_2O_4$
 Phthalimide, *N,N'*-*p*-phenylenedi-
 $C_{22}H_{12}O_4$
 3,9-Perylenedicarboxylic acid
 $C_{22}H_{14}ClNO_4$
 Anthraquinone, 1-benzamido-5-chloro-4-methoxy-
 $C_{22}H_{14}O_4$
 [1,1'-Binaphthalene]-8,8'-dicarboxylic acid
 $C_{22}H_{16}NO$
 2-Anthro-*o*-toluidide, 3-hydroxy-
 $C_{22}H_{18}N_2$
 2,6-Naphthalenediamine, *N,N'*-diphenyl-
 $C_{22}H_{18}N_2O_2$
 Anthraquinone, 1-methylamino-4-*p*-toluidino-
 $C_{22}H_{18}N_2O_3S$
 1-Naphthalenesulfonic acid, 6,8-dianilino-
 $C_{22}H_{18}N_2O_4$
 1-Naphthalenesulfonic acid,
 8-anilino-5-(*p*-hydroxyanilino)-
 $C_{22}H_{23}ClN_4$
 Phenazinium chloride, 3-amino-7-diethylamino-5-phenyl-
 Diethylphenosafranin
 $C_{22}H_{24}N_2O_4$
 4,4''-Bi-*o*-acetoacetotoluidide
 $C_{23}H_{15}NO_3$
 3-Dibenzofurancarboxamide, 2-hydroxy-*N*-1-naphthyl-
 $C_{23}H_{18}N_2O_5S$
 1-Naphthol-3-sulfonic acid, 6-(*p*-benzamidoanilino)-
 $C_{23}H_{20}N_2O_4S$
 1-Naphthalenesulfonic acid,
 5-(*p*-hydroxyanilino)-8-*p*-toluidino-
 $C_{25}H_{25}ClN_2$
 2,5-Xylidine, 4,4'-(*o*-chlorobenzylidene)di-
 Triphenylmethane, 4,4''-diamino-
 2-chloro-2',2'',5',5''-tetramethyl-
 $C_{23}H_{25}ClN_4$
 Phenazinium chloride,
 3-amino-7-diethylamino-2-methyl-5-phenyl-
 $C_{23}H_{26}N_2$
 2,5-Xylidine, 4,4'-benzylidenedi-
 Triphenylmethane,
 4,4'-diamino-2,2',5',5'-tetramethyl-
 $C_{23}H_{27}N_3$
 Aniline, *N',N',N'',N'''*-tetramethyl-3,4',4''-methylidynettri-
 Aniline, *N',N',N'',N'''*-tetramethyl-
m,p',p''-methylidynettri-
 $C_{24}H_{10}N_2O_4$
 3,4,9,10-Perylenetetracarboxylic diimide
 $C_{24}H_{12}O_2$
 Dibenzo[*a,i*]pyrene-5,8-dione

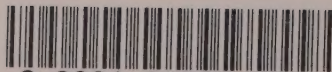
$C_{24}H_{12}O_8$
 3,4,9,10-Perylenetetracarboxylic acid
 $C_{24}H_{14}N_2O_2$
 β-Naphthindigo
 $C_{24}H_{14}O_2$
 Benzanthrone, 3-benzoyl-
 $C_{24}H_{16}O_2$
 Naphthalene, 1,5-dibenzoyl-
 $C_{24}H_{18}N_2O_3$
 11*H*-Benzo[*a*]carbazole-3-carbox-*p*-anisidide, 2-hydroxy-
 $C_{24}H_{18}N_4O_9S_3$
 2,2'-Stilbenedisulfonic acid, 4-amino-
 4'-(7-sulfo-2*H*-naphtho[1,2]triazol-2-yl)-
 $C_{24}H_{18}O_6$
 [1,1'-Binaphthalene]-8,8'-dicarboxylic acid,
 5,5'-dimethoxy-
 $C_{24}H_{19}N_3O_6S$
 1-Naphthol-3-sulfonic acid,
 6-[*m*-(*m*-aminobenzamido)benzamido]-
N-m-Aminobenzoyl-*m*-aminobenzoyl-*J* acid
 1-Naphthol-3-sulfonic acid,
 6-[*m*-(*p*-aminobenzamido)benzamido]-
N-p-Aminobenzoyl-*m*-aminobenzoyl-*J* acid
 1-Naphthol-3-sulfonic acid,
 6-[*p*-(*p*-aminobenzamido)benzamido]-
N-p-Aminobenzoyl-*p*-aminobenzoyl-*J* acid
 $C_{24}H_{20}N_2O_3$
 Anthraquinone, 1-(*N*-methylacetamido)-4-*p*-toluidino-
 $C_{24}H_{20}N_4O_5S$
 2-Naphthalenesulfonic acid, 5,8-bis(*p*-aminobenzamido)-
 $C_{24}H_{22}N_2$
 2,7-Naphthalenediamine, *N,N'*-di-*p*-tolyl-
 $C_{24}H_{26}N_2O_4$
 Terephthalic acid, 2,5-dianilino-3,6-dihydro-, diethyl ester
 $C_{25}H_{20}N_2O_3$
 11*H*-Benzo[*a*]carbazole-3-carbox-*p*-anisidide,
 2-hydroxy-2'-methyl-
 $C_{26}H_{16}O_2S_2$
 Anthraquinone, 1,8-bis(phenylthio)-
 $C_{26}H_{20}N_2$
m-Phenylenediamine, *N,N'*-di-2-naphthyl-
 $C_{26}H_{20}N_2O_6S_2$
 2-Naphthalenesulfonic acid,
 6,6'(or 7,7')-(*m*-phenylenediimino)di-
 $C_{27}H_{24}N_6O_9S_2$
 Benzenesulfonic acid,
 5,5'-ureylenebis[2-(*p*-aminobenzamido)-
 3,3'-Diphenylureadisulfonic acid,
 4,4'-di-(*p*-aminobenzamido)-
 $C_{27}H_{35}N_3O_8S_2$
 Toluene-2,4-disulfonic acid, 6-amino-*α,α*-bis-
 (*p*-diethylaminophenyl)-*α*,5-dihydroxy-
 2,4-Triphenylcarbinoldisulfonic acid, 6-amino-
 4,4''-bis(diethylamino)-5-hydroxy-
 $C_{28}H_{14}BrNO_4$
 Anthraquinone, 2-bromo-1,1'-iminodi-
 $C_{28}H_{15}NO_4$
 Anthraquinone, 1,1'-iminodi-
 $C_{28}H_{16}N_2O_4$
 2,2'-Bianthraquinone, 1,1'-diamino-

$C_{28}H_{16}O_6$
 Alizarin, dibenzoate
 $C_{28}H_{17}N_3O_4$
 Anthraquinone, 1,1'-iminobis[4-amino-
 $C_{28}H_{18}N_2O_4$
 Anthraquinone, 1,5-dibenzamido-
 Anthraquinone, 2,6-dibenzamido-
 $C_{28}H_{24}N_4O_8S_2$
 2,2'-Stilbenedisulfonic acid, 4,4'-bis(*m*-aminobenzamido)-
 $C_{30}H_{14}O_2$
 8,16-Pyranthredione
 Pyranthrone
 $C_{30}H_{18}O_2$
 Pyrene, 1,6-dibenzoyl-
 $C_{30}H_{18}O_4$
 1,1'-Bianthraquinone, 2,2'-dimethyl-
 $C_{30}H_{18}O_4S$
 Anthraquinone, 2,2'-(thiodimethylene)di-
 Bis(2-anthraquinonylmethyl) sulfide
 $C_{34}H_{16}Br_2O_2S$
 Benzanthrone, 3,3'-thiobis[9-bromo-

$C_{34}H_{16}O_2$
 Isoviolanthrone
 Violanthrone
 $C_{34}H_{16}O_4$
 Violanthrone, 16,17-dihydroxy-
 $C_{34}H_{18}O_2$
 4,4'-Dibenzanthronyl
 $C_{34}H_{22}O_2$
 1,1'-Binaphthyl, 4,4'-dibenzoyl-
 $C_{36}H_{12}N_6O_{12}$
 Decacyclene, hexanitro-
 $C_{36}H_{15}N_3O_6$
 Decacyclene, trinitro-
 $C_{36}H_{18}$
 Decacyclene
 $C_{36}H_{20}O_4$
 Violanthrone, 16,17-dimethoxy-
 $C_{36}H_{26}N_2O_4$
 4',4'''-Bi-2-naphtho-*o*-toluidide, 3,3''-dihydroxy-
 $C_{36}H_{26}N_2O_6$
 4',4'''-Bi-2-naphtho-*o*-anisidide, 3,3''-dihydroxy-
 Bis(3-hydroxy-2-naphthoyl)dianisidine
 $C_{42}H_{25}N_3O_6$
 Anthraquinone, 1,1'-iminobis[4-benzamido-

NOTES

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